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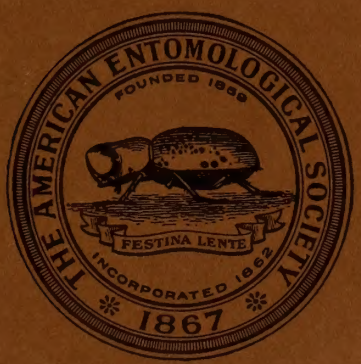
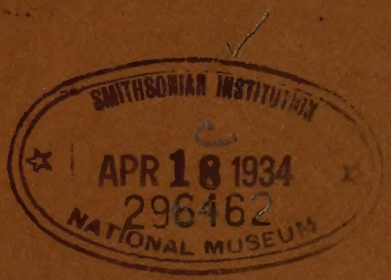
MEMOIRS
OF THE
AMERICAN ENTOMOLOGICAL SOCIETY
NUMBER 8

THE EUMASTACINAE
OF
SOUTHERN MEXICO
AND CENTRAL AMERICA

BY

JAMES A. G. REHN
AND JOHN W. H. REHN





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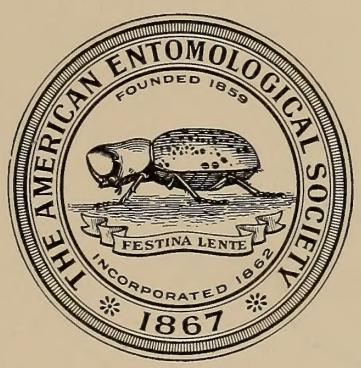

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THE EUMASTACINAE (ORTHOPTERA; ACRIDIDAE) OF SOUTHERN MEXICO AND CENTRAL AMERICA

BY JAMES A. G. REHN AND JOHN W. H. REHN

There is no group of acridoid Orthoptera which on the whole is more interesting or weirdly specialized than the Eumastacinae, yet few working orthopterists have been privileged to know these fascinating locusts in life. As one of these fortunate the senior author developed a special interest in the group as early as 1909, when *Morsea* was encountered and *Psychomastax* discovered by him in California. This interest steadily increased as his acquaintance with the species of the subfamily broadened through field work in Central and South America, in the former of which regions particular attention was paid to these insects during three seasons of field exploration.

The bush-loving North American eumastacids prefer different environments from those of most of the Central and South American species, but all of these agree with many of the other members of the subfamily found elsewhere in the sprightliness of their actions and their characteristic posture. With legs akimbo and their short antennae erect and parallel, they sit, vigilance personified, on bush tops in chaparral, silhouetted against the sky, on undergrowth foliage in dark rain-forests, or on the ground or low ground cover in mist-soaked mountain forests.

The amount of Central American material and correlated information now available has made desirable the preparation of a comprehensive study of the subfamily as found in Central America and adjacent southern Mexico. This is particularly warranted

as the extensive series now before us, from the Philadelphia collections, embraces all but one of the species now known to occur in the area under consideration.

Rehn and Hebard more than a decade ago presented in the "Transactions" of this Society[1] a study of the Eumastacinae found in the United States. Much detailed information supplementary to that contained in the same paper recently appeared from Mr. Hebard's pen. Nothing is known regarding the Eumastacinae which certainly occur in northern and central Mexico, in suitable environments. The sole vague record from "Mexico" in the literature of the past is discussed on a following page under the genus *Eumastax*. The genus *Teicophrys* was described by Bruner[2] from the Cape San Lucas region of Lower California, on the basis of an imperfect female and two very immature specimens. No additional information on this genus is available and its exact relationship remains problematical.

In order to make the present study comprehensive and constructive in its scope and treatment, we have limited its area on the north to southern Mexico, or to be more exact that portion below the Isthmus of Tehuantepec, thus confining it to the geological, if not political, unit of Central America.

Whether the rank of the entity here discussed should be that of a family or of a subfamily we shall leave to future research. Burr in his classic "Essai sur les Eumastacides"[3] considered the primary divisions of the eumastacids to be sub-tribes or groups, but in his treatment in the Genera Insectorum[4] he departed from this arrangement, gave them as a whole family rank and called his previously segregated sub-tribes sub-families. In 1914 Candido Bolivar, in one of his earlier papers on the group,[5] used the term "sections" for the major divisions of the Eumastacinae, which he there considered a subfamily. In the first part of his "Mono-

[1] Vol. XLIV, pp. 223–250, pls. xi–xvi, (1918).
[2] Biol. Cent.-Amer., Orth., II, p. 21, (1901).
[3] Anales Soc. Españ. Hist. Nat., XXVIII, pp. 75–112, 253–304, pls. viii–ix, (1899).
[4] Genera Insectorum, fasc. 15, Orth., Eumastacidae, pp. 2–23, 1 plate, (1903).
[5] Trab. Mus. Nac. Cienc. Nat., Madrid, Ser. Zool., no. 16, pp. 3–46.

grafía de los Eumastácidos,"[6] issued in 1930, the same author considers the group as a family and the major divisions as subfamilies. Tentatively we prefer to call the assemblage a subfamily and to refer to the subdivisions as "groups." It should be understood, however, that this course implies no settled conviction, or opposition to the general raising of the whole acridoid group to superfamily rank, and the major divisions of the same to families. It has instead been dictated by a desire for reasonable conservatism, until the values of the conventional subdivisions of the acridoids have been more clearly interpreted. The arbitrary elevation of many genera groups to subfamily rank, which logically follows, seems unwarranted, at least until we have a better conception of the relative importance of the features characterizing these assemblages. A proper sense of proportion will doubtless prevent many absurdities which otherwise would result from an arbitrary "boosting" of the rank of many genera groups.

We wish to thank Mr. B. Uvarov, of the British Museum of Natural History, and Dr. J. Carl, of the Museum of Natural History at Geneva, for their generous assistance, which made possible the solution of several of the most troublesome problems involving species of earlier authors. Their examination of historic type material enabled us to place two of the five species described prior to 1923 from the region covered by this study. The remaining three older names have given less difficulty, and the types or paratypes of those species described since that date have been before us.

Of the fifteen species recognized in the present paper we have seen material of all but one, and the types of ten and paratypes of another have been examined at this time. Of the fifteen species the senior author has personally collected eight. The total number of specimens examined is 443, all from the collection of the Academy of Natural Sciences of Philadelphia and the Hebard Collection, except thirty-eight from the Museum of Comparative Zoology and a few belonging to Cornell University. The splendid

[6] Trab. Mus. Nac. Cienc. Nat., Madrid, Ser. Zool., no. 46, pp. vi–xxxii, 1–380.

representation of the subfamily taken in 1930 by the Academy-Emlen-Worth Expedition of the Academy of Natural Sciences to Honduras is largely responsible for the present study. The extensive series then secured helped elucidate problems virtually impossible of solution at this time without them. The lively interest of Mr. John T. Emlen, Jr., and Mr. C. Brooke Worth, who accompanied the senior author, and through whose support the work was made possible, aided materially in building up this series of eumastacids. In addition the series taken in 1923 and 1927 in Costa Rica by the senior author, when on Academy expeditions, permitted a proper understanding of the Costa Rican members of the subfamily. In all 349 specimens of those studied were taken on Academy expeditions.

For a characterization of the Eumastacinae which sufficiently embraces the many highly specialized and even grotesque genera, we would refer the student to Burr's treatment in the Genera Insectorum,[7] while for a comprehensive treatment of the limited representation occurring north of Mexico the study by Rehn and Hebard,[8] already mentioned, should be consulted.

A linear arrangement of the genera and species treated in the present study is as follows:

Group Episacti	Group Eumastaces
Gymnotettix Bruner	*Eumastax* Burr
G. occidentalis Bruner	*E. kressi* new species
G. lithocolletus new species	*E. surda* Burr
Episactus Burr	*E. dentata* Saussure
E. brunneri Burr	*E. veraguae* Hebard
E. tristani new species	*E. sylvicola* new species
E. eremites new species	*E. hondurensis* new species
Lethus new genus	*E. cerciata* Hebard
L. maya new species	
L. maya amrami new subspecies	
L. oresterus new species	

[7] Genera Insectorum, fasc. 15, Orth., Eumastacidae, pp. 2–23, 1 plate, (1903).
[8] Trans. Amer. Entom. Soc., XLIV, pp. 223–250, pls. xi–xvi, (1918).

Key to Genera

1. Caudal metatarsi with dorsal margins spinulose. Species apterous. (Group Episacti.) 2

Caudal metatarsi with dorsal margins unarmed. Species fully alate. (Group Eumastaces.) ..... **Eumastax** Burr

2. Surface subglabrous to micro-shagreenous, never rugulose. Fastigium as seen in lateral aspect rectangulate, not at all acute produced. Median carina at most but indistinctly indicated on fastigium or occiput. Antennae hardly broadened distad, articles five to seven distinctly longer than broad, subcylindrical. Ultimate tergite (supra-anal plate) of male longer than broad, never broader than long ..... **Gymnotettix** Bruner

Surface rugulose to a variable degree, never generally subglabrous, in female sex at least. Fastigium as seen in lateral aspect acute-angulate and produced cephalad of eyes. Median carina distinctly, but sometimes finely, indicated on fastigium and occiput. Antennae broadened distad, articles five to seven little longer than broad and never subcylindrical. Ultimate tergite (supra-anal plate) of male broader than long 3

3. Frontal costa hardly constricted at the paired ocelli, above same lateral margins of costa are somewhat evenly expanding, but costa there never three times as broad as between ocelli. Ultimate sternite (subgenital plate) of male with distal margin trigonal produced mesad to varying degrees, never styloid digitiform, margin of production evenly uncinato-denticulate. Ovipositor of female with valves less compressed; ventral valves mesad on ventro-internal margin with a single tooth of more marked development than the other marginal teeth. Ultimate sternite (subgenital plate) of female distad elongate produced, with apex acute or finely tridenticulate or little produced and deeply bis-emarginate ..... **Episactus** Burr

Frontal costa distinctly constricted at the paired ocelli, above same lateral margins of costa are markedly bullate expanded laterad, costa there at least three times as broad as between ocelli. Ultimate sternite (subgenital plate) of male produced mesad into a pronounced recurved digitiform process, bearing an apical and lateral paired elongate spines. Ovipositor of female with valves markedly compressed, elongate; ventral valves lacking any specially developed tooth on ventro-internal margin. Ultimate sternite (subgenital plate) of female moderately produced meso-distad, apex of same rounded, tridentate or subtruncate with median trigonal tooth ..... **Lethus** new genus

Text-figure 1. Distribution of the Group Episacti in Mexico and Central America, and of *Eumastax hondurensis*. Localities for the respective forms indicated as follows: *Gymnotettix occidentalis* by dots, *G. lithocolletus* by circles, *Episactus brunneri* by solid squares, *E. tristani* by hollow squares, *E. eremites* by hollow diamonds, *Lethus maya maya* by solid triangles, *L. maya amrami* by hollow triangles, *L. oresterus* by solid diamonds, *Eumastax hondurensis* by crosses.

Text-figure 2.—Distribution of Costa Rican and Panamanian species of the genus *Eumastax*. Localities for the respective species indicated as follows: *bressi* by dots, *surda* by circles, *veraguae* by solid squares, *dentata* by hollow squares, *silvicola* by hollow triangles, *cerciata* by solid triangles.

Systematic Treatment

Group Episacti

GYMNOTETTIX Bruner

1901. *Gymnotettix* Bruner, Biol. Cent.-Amer., Orth., II, pp. 20, 21.

Genotype (by monotypy): *G. occidentalis* Bruner.

The present genus is more generalized than the other Central American genera referred to the Group Episacti. While fully representative of the latter in the spination of the dorsal margins of the caudal metatarsi and in the fastigial and frontal costal structure, as well as the general build of the body and limbs, *Gymnotettix* suggests genera which are members of the Group Eumastaces. For this reason we are discussing it first and treating the other two genera as progressive specializations of the Episacti.

The two species here referred to *Gymnotettix* differ very decidedly in structural details, particularly of the abdominal appendages, but are clearly congeneric.

The genus was based on a single female of *G. occidentalis*, not then recognized as immature. The anomalous character originally ascribed to it, of toothless margins to the ovipositor jaws, and which figures in the generic diagnosis, is due to immaturity, while the fastigial structure described is also due to the same stage of development. We have been able to match the structural features of the type of *G. occidentalis* perfectly in the extensive series of *G. lithocolletus* now before us. Suspecting the unique type of *occidentalis* to be immature, we asked the help of our colleague Mr. Uvarov, of the British Museum of Natural History, where this specimen is preserved. He confirmed our suspicions and was also kind enough to send a sketch of the ovipositor jaws. The drawing shows the faint indications of future marginal teeth, as in similar females now before us.

In consequence the generic features given by Bruner have no real value, and the following generic analysis is the first of *Gymnotettix* based on adult material.

Generic features.—Apterous, body subcompressed. Surface subglabrous to micro-shagreenous. Head with fastigium arcuate to arcuato-truncate, in profile rectangulate, non-produced; dorsum

of fastigium and occiput with median carina obsolete or subobsolete; face in profile oblique, low arcuate between antennal bases; frontal costa sulcate, little and then gradually narrowed between paired ocelli, margins gently diverging dorsad. Antennae ten-segmented, distad faintly broadening to ultimate article, individual segments (except second) longer than broad, cylindrical except distal subdepressed one. Pronotum medio-longitudinally carinate, no lateral carinae present: cephalic margin of disk subtruncate, caudal margin of same broadly and shallowly V-emarginate mesad: disk evenly passing into lateral lobes, in profile pronotum is subequal in length and greatest depth or sublongitudinal; ventro-cephalic angle rounded obtuse, ventro-caudal angle rounded rectangulate. Mesonotum, metanotum and abdomen markedly and continuously medio-longitudinally carinate. Fourth sternite of abdomen of male with a distinct node-like protuberance. Male with tenth tergite transversely emarginate mesad; ultimate tergite (supra-anal plate) scutellate, subequal in length and breadth or longer than broad, apex subacute; male cerci tapering in proximal half, distad incurved or inbent and with apices variously developed; ultimate sternite (subgenital plate) subscaphiform, distal margin sublamellately angulate produced, with border of production uncinato-denticulate. Female with tenth tergite broadly V-emarginate mesad; ultimate tergite (supra-anal plate) acute lanceolate; female cerci acutely tapering, simple; ultimate sternite (subgenital plate) narrowly produced meso-distad, apex angulate; ovipositor valves with all margins serrato-dentate except distal section of ventro-internal, ventral valves ventrad with a median transversely disposed dentation. Limbs slender; cephalic and median pair multicarinate, tibiae spinulose on ventral margins; caudal femora inflated proximad, slender distad, dorsal margins serrulato-denticulate, genicular lobes and angles briefly spinose; caudal tibiae with internal spines longer than external, former biseriate and somewhat crowded distad; apical spurs with internal pair larger than external, extensor one on each side longer than flexor; caudal metatarsi subequal to half of total tarsal length, concavo-sulcate dorsad with both dorsal margins spined; caudal tarsal claw of each limb slightly longer than cephalic.

Distribution.—From the Usumacinta Valley of the Department of Peten, Guatemala, and very probably the adjacent portion of the same valley in the states of Chiapas and Tabasco, Mexico, south at least to the Cuyamaca Valley of northern Honduras, the Comayagua district, and the semi-arid upper valley of the Rio Choluteca, south-central Honduras, eastward in the northern portion of its range to the Rio Sarstoon, which forms the southern boundary of British Honduras.

Key to Species

Size larger (♂, average body length, 14.9 mm.; caudal femur, 12.5: ♀, body length, 21.7; caudal femur, 15). Male with tenth abdominal tergite having medio-dorsal emargination strongly transverse, concavely arcuate; ultimate tergite (supra-anal plate) of male with dorsal surface bearing acutely converging carinate ridges; male cerci markedly enlarged distad and there with a decided dorsal digitiform tooth; ultimate sternite (subgenital plate) of male with distal margin developed mesad into an erect, sublanceolate, strongly acute production. Cephalic and median coxae not marked with scarlet. Lateral lobes of pronotum washed with pale scarlet, which also colors the apex of the abdomen. (Guatemala, British Honduras (?) and northern Honduras.).....*occidentalis* Bruner

Size smaller (♂, body length, 13.7–15.8 mm.; caudal femur, 11–12.3: ♀, body length, 16.9–20.9; caudal femur, 12.8–13). Male with tenth abdominal tergite having medio-dorsal emargination subtransverse, subcuneate, not concavely arcuate; ultimate tergite (supra-anal plate) without acutely converging carinate ridges; male cerci not enlarged distad and without a dorsal digitiform tooth; ultimate sternite (subgenital plate) with distal margin subacute-angulate, but not sublanceolate produced. Cephalic and median coxae and adjacent portions of pleura almost invariably vividly scarlet,[9] which also colors the apex of the abdomen; lateral lobes of pronotum without scarlet. (South and central Honduras.).....*lithocolletus* new species

Gymnotettix occidentalis Bruner (Plate III, figs. 5–10.)

1901. *Gymnotettix occidentalis* Bruner, Biol. Cent.-Amer., Orth., II, p. 21. [(Immature) ♀; Rio Sarstoon, British Honduras.][10]

Under the generic treatment we have already discussed the

[9] This species is dichromatic, possessing a brown phase, which may be rare, judging from present material. In that phase no scarlet is present on any part of the body.

[10] While the type was said to be from British Honduras, the Rio Sarstoon forms the southern boundary of British Honduras and its right bank as well as the entire upper course is in Guatemala. The genus is also unrepresented in considerable series of Orthoptera now in our hands from southern British Honduras. These points are mentioned merely to show that occurrence on the Rio Sarstoon does not necessarily mean presence in British Honduras.

immature condition of the unique type of this, the genotypic, species. No further comment is necessary here, other than that the exceedingly brief (three line) specific description of *occidentalis* gives no feature which would distinguish the type from the pair here discussed. The description does, however, emphasize the reddish color of the lateral lobes of the pronotum and of the apex of the abdomen, while it makes no specific comment on the color of the coxae, which are such striking features of the color pattern of *lithocolletus*, combined with the absence of scarlet from the latter's pronotum.

The following description of an adult male and female should assist in the recognition of this species, so imperfectly known previously.

♂; Piedras Negras, Usumacinta River, Department of Petén, northern Guatemala. Elevation, 600 to 800 feet. June 30, 1933. (David W. Amram, Jr.) [Acad. Nat. Sci. Phila.]

Size medium; surface of body almost entirely micro-shagreenous, dully glistening.

Head with occiput appreciably ascending, in dorsal aspect regularly narrowing to the fastigium, which in width equals slightly more than one-fifth the entire width of the head across the eyes (as 13 to 60), but very faintly surpassing the eyes cephalad and transversely truncate with latero-cephalic angles sharply rounded, slight lateral bordering carinulae indicated, median carina obsolete; fastigium in profile rounded rectangulate; facial line with inter-antennal arcuation occupying about half of length of face; frontal costa more deeply sulcate in the area of the inter-antennal arcuation than elsewhere, becoming shallow dorsad toward the fastigio-facial angle: eyes moderately prominent, greatest width across same slightly greater than width of head at clypeal base, ovoid in basal outline, subacute ventro-cephalad, in greatest depth equal to 1.65 times depth of infra-ocular portion of genae. Antennae subequal in length to face dorsad of clypeus, relatively slender, distal broadening very gradual from third article; distal article faintly subspatulate, in part concave dorsad.

Pronotum subsellate, but dorsal line nearly straight in profile, emargination of caudal margin of disk slight; in lateral view greatest (caudal) depth is subequal to dorsal length, ventral margin oblique, very faintly concave, caudal margin nearly straight, very obscurely bisinuate; impressed sulcation on ventral two-thirds of lateral lobes median, subvertical, inclining slightly cephalad, distinct. Mesonotum and metanotum distinctly tectate, caudal margins transverse truncate.

Tenth abdominal tergite with median emargination over twice as broad as deep, strongly concave, caudo-lateral angles limiting same developed into decurved, elongate, acute, sublinguiform lobes covered with rasp-like asperities; lateral portions of margin of tergite, encircling bases of cerci, shallowly concave, with the

ventro-caudal angle rounded rectangulate. Ultimate tergite (supra-anal plate) with greatest proximal width subequal to median length, lateral margins acute converging distad, subsigmoid, apex sharply acute, faintly decurved; dorsal surface with a pair of marked straight oblique, converging, rounded ridges, which join at the apex of the tergite. Cerci slightly compressed in proximal two-thirds, in lateral aspect slightly narrowing distad in the same area; distal third sharply inbent at but slightly less than a right angle, enlarged and thickened, vertically truncate at the broadened apex and at the disto-dorsal angle furnished with a suberect, incurved, uncinate tooth, vicinity of the disto-ventral angle supplied with a few shagreenous denticulations. Ultimate sternite (subgenital plate) with its major portion relatively short, transverse, subscaphiform; distal margin with the subparallel lateral sections short, straight, unspined, median section of margin developed into an erect, lanceolate lamellate process, with its greatest proximal width subequal to its median length, the margins concavely notched laterad at the base of the process thence, distad slightly arcuate, acute convergent to the apex, supplied with numerous, but generally spaced, slightly recurved denticulations; in lateral view the process is seen to incline slightly caudad, with the tip curving more strongly in that direction; ventral (i. e. caudal) surface of production distad briefly subcarinate mesad. Fourth sternite with nodose protuberance of caudal section broadly rounded but strongly marked, non-compressed.

Cephalic femora twice as long as pronotum. Median femora but faintly shorter than cephalic pair, slightly more robust. Caudal femora surpassing apex of abdomen by about two and two-thirds times the pronotal length.

♀ ; Same data as described male.

Differing from the above description of the male in the following noteworthy features.

Size above medium for Episacti.

Head with width of fastigium slightly less than a fourth of width of head across eyes (as 18 to 76), as seen from dorsum fastigium is as a whole arcuato-truncate, less flattened than in the male; facial line with inter-antennal arcuation less elevated than in male; frontal costa less deeply sulcate immediately dorsad of the median ocellus; greatest width across eyes and of head at clypeal base subequal; eyes in greatest depth equal to 1.17 times depth of infra-ocular portion of genae. Antennae damaged.

Pronotum with dorsal portion of lateral lobes bearing obscure traces of longitudinal low carinulae, these disconnected and evanescent cephalad and caudad.

Tenth abdominal tergite broadly V-emarginate dorso-mesad, the tergite severed and the emargination continued as a shallow groove-like depression mesad across the ninth tergite; caudo-ventral angles produced ventrad of cerci and infra-cercal plates into acute lobes. Ultimate tergite (supra-anal plate) subcompressed laterad, with sculpture of dorsal disk showing in proximal three-fifths a longitudinally disposed broad-ovate area, shallowly impressed within the peripheral margin and this divided in two longitudinally by a further shallow impression, which arcuately

widens proximad and distad, distal portion transversely arcuate, apex as seen from dorsum slightly acute. Cerci falling slightly short of apex of ultimate tergite, regularly tapering, apex acute. Ovipositor valves with external margin of dorsal valves more strongly and serrately dentate than internal margin, distal third of dorsal surface of same valves concavo-excavate, lateral areas of dorsal valves subdeplanate; ventral valves with median tooth of ventro-internal margin marked, transversely disposed but not entirely crossing valve, surface divided into two planes at this tooth, the proximal deplanate, the distal distinctly concavo-excavate. Ultimate sternite (subgenital plate) with medio-distal production rectangulate at apex.

Cephalic and median limbs proportionately somewhat shorter than in male. Caudal femora surpassing apex of ovipositor by faintly less than pronotal length.

Coloration.—General tone of males dull orange-citrine to dark citrine, lightening on the limbs to aniline yellow and darkening on the venter of the abdomen and much of the preapical portion of the dorsum of the same to medal bronze. The females, apparently discolored in this respect by desiccation, are more uniformly medal brown on the body as a whole, the limbs showing evidence of having been more uniformly aniline yellow to old gold. Head in the males medal bronze with blotchings of orange-citrine; eyes largely fuscous, in females marked obliquely (drying?) with buckthorn brown; antennae orange-citrine. Pronotum with ventral half of side washed with scarlet-red, females show evidence of same through its general discoloration. Coxae of body color; mesosternum of males distinctly and metanotum weakly washed with scarlet-red. Apex of abdomen, in the males involving tenth and ultimate tergite, cerci and ultimate sternite and portions of the ninth tergite and ninth sternite, solidly scarlet-red to carmine, doubtless very vivid in life; in the females before us the abdominal apex is largely discolored and the extent of the scarlet cannot be determined, although traces of it can be seen on the ovipositor and ultimate tergite. Caudal tibiae dull olivaceous, with fuscous carinae and blackish spines and spurs; caudal tarsi courge green, clouded with fuscous distad, spines blackish.

Supplementing the pair described above we have received for study from the collection of the Museum of Comparative Zoology, two males and one female from the Cuyamapa Valley, a tributary branch of the Sula Valley of northwestern Honduras, taken September 1 by Stadelmann. These individuals are inseparable

in structural features from the Piedras Negras specimens, but are very much larger, as the measurements given above demonstrate. The coloration, as far as preserved, would indicate in life a vivid brilliancy, probably equal to that known in the other species of the genus.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Piedras Negras, Guatemala	14.9	2.18	12.5
♂, Cuyamapa Valley, Honduras	21.7	2.85	15.7
♂, Cuyamapa Valley, Honduras	17.5[11]	2.77	16
♀, Piedras Negras, Guatemala	21.7	2.6	15
♀, Cuyamapa Valley, Honduras	25.5	3.19	18.5

Distribution.—From extreme northwestern Guatemala south and east to the Rio Sarstoon district of eastern Guatemala, and the eastern arms of the Sula Valley of northwestern Honduras (Cuyamapa Valley). Apparently the species does not occur across the Continental Divide on the Pacific slope, and, in Honduras at least, it is there replaced by the following species. The latter, however, seems partial to an environment of different character from that found where *occidentalis* has been taken.

Gymnotettix lithocolletus[12] new species (Plate I, fig. 1; pl. III, figs. 11–15.)

This very striking and distinctive species can at once be distinguished from *occidentalis* by the form of the tenth tergite, the cerci, the ultimate tergite (supra-anal plate) and of the ultimate sternite (subgenital plate) of the male, as well, in both sexes, as by the absence of scarlet from the pronotum and the almost invariable presence of striking scarlet areas involving the cephalic and median coxae.

Type.—♂; Cantarranas, Rio Choluteca, Department of Tegucigalpa, Honduras. Elevation, 2200 feet. August 4, 1930. (Academy-Emlen-Worth Expedition; J. A. G. Rehn.) [Academy of Natural Sciences of Philadelphia, Type no. 5531.]

Size slightly smaller than in *G. occidentalis;* surface subglabrous to micro-shagreenous, the pronotum laterad particularly subglabrous, body as a whole more glistening than in *G. occidentalis.*

[11] Apex of abdomen sharply recurved.

[12] From λιθοκόλλητος, *inlaid with precious stones,* in allusion to its gem-like brilliancy in life.

Head with truncation of fastigium, as seen from dorsum, slightly more rounded laterad, width and production of same as in *occidentalis;* profile of fastigium and obsolescence of median carina of same as in *occidentalis;* facial line with inter-antennal arcuation slightly less marked than in *occidentalis;* frontal costa similar to that of *occidentalis* but slightly wider ventrad of the paired ocelli; eyes in profile faintly narrower than in *occidentalis*, slightly shorter proportionately, the greatest depth equal to 1.48 times depth of infra-ocular portion of genae. Antennae appreciably longer than face dorsad of clypeus (as 86 to 76), more slender than in *occidentalis*, distal article similar to that of latter species but less robust.

Pronotum in general as in *occidentalis* but ventro-cephalic angle less broadly rounded and more truly obtuse-angulate, while the ventro-caudal angle is sharper and more nearly rectangulate, the caudal portion of the ventral margins being more distinctly truncate and less broadly arcuate; caudal margin of lateral lobes virtually straight, not bisinuate; lateral lobes with several low cicatriform areas longitudinally disposed dorso-mesad, these not true carinae, broken by the vertical impressed sulcus; median vertical sulcus as in *occidentalis*, with in addition two parallel, closely intermarginal ones near the caudal margin, that nearer the margin weaker and less extensive.

Tenth abdominal tergite with median emargination twice as broad as deep, truncate subcuneate, the bottom of same arcuate truncate, the lateral portions of the margin diverging caudad, straight oblique, caudo-lateral angles limiting emargination slightly acute, somewhat decurved, but not elongate lobes as in *occidentalis*, surface asperities of angles distinct but smaller and more numerous than in *occidentalis;* lateral portions of margin of tergite, encircling cercal bases, as in *occidentalis*, but caudo-ventral angle faintly acute produced. Ultimate tergite (supra-anal plate) with greatest (median) width contained slightly more than one and one-half times in length of tergite (as 22 to 35), the shape of the tergite subpyriform, evenly narrowing proximad from widest point, and filling the emargination of the tenth tergite, the margins sinuately converging distad to the sublinguiform, acute apex, which reaches to the cercal apices when the cerci are in their usual position; dorsal surface of ultimate tergite with most of the distal two-thirds shallowly concave within the lateral margins, no indications present of converging carinate ridges, such as occur in *occidentalis*. Cerci proximad subcompressed as in *occidentalis*, dorsally carinate in that area, as seen from the dorsum the proximal half is slightly incurved, the distal half is strongly incurved but not bent, the slender distal fourth directed inward at slightly more than a right angle to the axis of the proximal half of the cercus; in profile the depth of the cercus tapers evenly from a deep base to the slender, subcompressed, forcep-like distal fourth, apex narrowly blunt acute with faint traces of single dorsal and ventral minute denticulations. Ultimate sternite (subgenital plate) with its proximal portion as in *occidentalis* but median production of distal margin slightly shorter and broad lanceolate, its height not more than two-thirds its proximal width, the lateral sections of the margin passing into that of the process without distinct notches as in *occidentalis*, the converging sides of the production nearly straight, the apex broadly rounded, the border of the whole production evenly supplied with larger, more distinctly recurved denticu-

lations than in *occidentalis;* in lateral view the production is seen to follow the regular convexity of the more proximal portion of the sternite. Fourth sternite with nodose protuberance more compressed and distally subtruncate than in *occidentalis.*

Cephalic femora one and seven-tenths times the pronotal length. Median femora virtually subequal to cephalic in length, more robust. Caudal femora with inflated proximal portion slightly broader than in *occidentalis.*

Allotype.— ♀ ; Same data as type except date is August 9, 1930. Differing from the above description of the male in the following noteworthy features.

Size when compared with female of *occidentalis* even smaller proportionately than the male of the present species; surface as in male.

Head with truncation of fastigium, as seen from dorsum, faintly more rounded laterad than in male; facial line with inter-antennal arcuation distinctly shorter, lower and less evident than in male; frontal costa shallower in sulcation than in male; eye in depth equal to 1.3 times infra-ocular portion of genae along supplementary carinae. Antennae distinctly shorter than in male, shorter than face, the ratio of length to that of face dorsad of clypeus being 68 to 80.

Apex of abdomen when compared with the same area of *G. occidentalis* with the ninth and tenth tergites medio-longitudinally deeply and narrowly sulcate, expanding caudad on tenth tergite to receive base of the much narrower, acute lanceolate ultimate tergite (supra-anal plate), the apex of which is sharply acute, while the dorsal surface is concavo-excavate in the proximal half and there with a very finely impressed medio-longitudinal sulcation, the distal half of same surface subdeplanate but not at all excavate, lateral areas of ultimate tergite vertical, subconcave, in proximal half separated from concave dorsum by sharply carinate lateral margins of latter. Cerci as in *occidentalis.* Ovipositor with dorsal valves much as in *occidentalis;* ventral valves with teeth of ventro-lateral margins larger and without intercalated denticulations as in *occidentalis,* median tooth of ventral surface as in latter. Ultimate sternite (sub-genital plate) with median production elongate, subcuneate, its lateral margins subparallel in proximal half, then concavo-acute convergent to the slightly upcurved apex.

Cephalic and median limbs proportionately somewhat shorter than in the male. Caudal femora surpassing apex of abdomen by less than pronotal length.

Coloration.—This species is dichromatic, but the far rarer brown phase has been seen in but two adult specimens, both females. The green phase is certainly the dominant condition at the type locality and probably represents the more usual condition of the species.

The following color description was made from a freshly killed green phase male, and we give it from the original field notes before presenting a more detailed analysis from the dried material.

Body above shining emerald green, turning turquoise blue on the head, apex of abdomen solidly carmine, above several abdominal segments before apex becoming pale turquoise blue with transverse black patches proximad, a medio-longitudinal fine black line. Eyes black; antennae black with two proximal segments pearl; postocular line black. Lateral lobes of pronotum of dorsal color with slight golden tendency; pleura in part and coxae of cephalic and median limbs carmine; remainder of mesopleura and metapleura turquoise blue; caudal coxae whitish. Lateral aspects of abdomen turquoise blue ventrad of lateral series of black patches; venter of abdomen pearl; meso- and metasterna turquoise blue with greenish reflections; base color of all limbs greenish straw yellow, lined with black.

The dry material is naturally far less brilliant than the gem-like effulgence of the freshly killed insect. It shows, however, the extent of variation seen in a long series, and also presents the color tones seen in the cabinet specimen. Taken with the above notes on the life colors, the following specific and detailed analyses of dried material should be of service.

Green phase.—General body color ranging from sulphine yellow to olive-yellow, quite dull on the head, washed to a variable depth and extent with dull fuscous black, as a whole the more elevated surfaces or sculpture of the body moderately polished and in consequence more evident. The general fuscous black infuscation ranges from a recessive extreme in which on the head bordering dark areas throw into relief the facial carinae and the fastigium, occiput and postocular areas are largely infuscate, on the pronotum the more deeply sculptured areas alone are infuscate, the meso- and metanota and pleura, and abdomen except apex are infuscate as on the pronotum, except that the sides of the abdomen in the region of the spiracles is more heavily infuscate, the sternum is medal bronze, the limbs as a whole with the carinae lined with fuscous and the caudal tibiae basically very weak glaucous; to an intensive extreme in which the infuscation is so general and pronounced that the head, pronotum, mesonotum, metanotum and abdominal terga except for the apex are almost wholly very dark fuscous citrine, but small areas, chiefly marginal, on the lateral lobes of the pronotum and a series of paired quadrate

blotches on the abdominal dorsum being all showing sulphine yellow to citrine, the pleura largely sulphine yellow, the sternum medal bronze to citrine, the limbs as in the recessive extreme except that the pale glaucous of the caudal tibiae is more marked, while the caudal femora are distinctly infuscate distad. Eyes generally dresden brown to mummy brown, rarely as light as buckthorn brown, often the two tones are mottled one with the other. Antennae fuscous black with two to three proximal articles cream. Apex of male abdomen, embracing everything distad of the eighth tergite and sternite, the prothoracic pleura and cephalic coxae, the cephalic surface of the meso-episternum and the apex of the more lateral surface of the same area, and the median coxae vivid scarlet to light carmine; in the female sex the involvement is similar except that of the abdominal apex includes the distal margin of the eighth tergite and the entire ultimate sternite (subgenital plate), while the ovipositor jaws are of the base color, except proximo-laterad where the scarlet suffusion is indicated.

Brown phase.—General color buckthorn brown to pale dresden brown, with broad lateral dull fuscous black bars extending from the postocular areas to the sides of the eighth tergite, the bars complete except for a diagonal paler linear interruption laterad on the pronotum and occasionally (one specimen) in part obsolete ventrad on the three proximal abdominal tergites; face ranging from the greenish of the green phase to dull ochraceous-buff; antennae dull vertiver green, darker distad, paler proximad, but with the two proximal articles light ochraceous-buff, the second in part annulate with fuscous; eyes as in green phase; ventral surface as dorsal surface; limbs ranging from much as in green phase to a pale buckthorn brown, in the latter the carinal infuscation is broken at many points and producing an interrupted "ticking" of the usually firm pencilling. No scarlet present anywhere in the brown phase.

Immature material shows the major elements of the adult coloration back to at least the second instar preceding material. The scarlet markings, however, are weak in the instar preceding maturity and almost absent in that next preceding. In life, however, this coloration was more evident than the dry immature

material would indicate, but never as vivid as in the adults. At least one individual in the instar preceding maturity (August 4) represents the brown phase.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Cantarranas, Honduras, *type*	13.4[13]	2.10	11.5
♂, Cantarranas, average of eleven *paratypes*	14.3	2.11	11.6
	(13.7–15.8)	(2.01–2.18)	(11–12.3)
♂, Minas de Oro, Honduras	13.9	2.26	12.5
♀, Cantarranas, Honduras, *allotype*	17.5	2.26	12.8
♀, Cantarranas, average of eleven *paratypes*	18.7	2.31	13.2
	(16.9–20.9)	(2.18–2.43)	(12.8–13.9)
♀, Minas de Oro, Honduras	20	2.85	16.5

Paratypic Series.—In addition to the type and allotype we have before us a series of one hundred and forty paratypic adult individuals (fifty-six males and eighty-four females) taken at the type locality, on various dates between July 19 and August 9, 1930, by the Academy-Emlen-Worth Expedition of the Academy of Natural Sciences of Philadelphia, in the collection of which it is contained.

Distribution.—Known from the upper valley of the Rio Choluteca and the Comayagua district in southern and central Honduras. The two localities from which the species is known are Cantarranas in the former valley, and Minas de Oro, approximately thirty miles northeast of the city of Comayagua and near the Rio Sulaco.

Morphological Notes.—The extensive Cantarranas series is very uniform in structure, but the single pair from Minas de Oro is slightly (♂) to appreciably (♀) larger than the average, or in some respects at least in the female sex than the maximum, from Cantarranas. The female from Minas de Oro is also noteworthy in having the lateral margins of the distal production of the ultimate sternite (subgenital plate) less narrowly produced and

[13] The apex of the abdomen of the type is more strongly recurved than usual, and in consequence the body length is relatively short.

more evenly conical in outline. The shape of the distal extremity of the same production, however, is as in the Cantarranas material. It is possible a series of females from Minas de Oro may show variation in the shape of the above mentioned lateral margins.

Biological Notes.—The semi-arid Pacific tropical element extends up the courses of at least certain of the rivers of western Honduras, and at Cantarranas on the upper Rio Choluteca we find well represented a flora strongly suggestive of that of the slopes bordering the Gulf of Fonseca. This is rich bush vegetation with clumps of trees, often of acacia-like types, some large and spreading, open potreros with low mimosas, occasionally cacti, and dense tangles of higher trees, climbing lianes and vines along the rather shallow river. Here in low cover, from near the ground to not over five feet above it, the present species was locally abundant. The preferred habitats included garden weeds in the neglected grounds of an old hacienda, in potreros, and similar weedy cover along jungly trails. Generally a pair would be found near one another, rarely in coitu, always reasonably active irrespective of sex. The brilliant living coloration made them exceptionally conspicuous.

Our first visit to Cantarranas was made July 19 to 20, when but five adults were taken, the majority of the specimens seen, twelve of which were taken, being immature. At least the two instars immediately preceding maturity were secured at that time. The second visit was August 2 to 9, during which time a steadily increasing proportionate number of adults was seen. On the 4th it was noted that about half were still immature, but no immature specimens were taken or noted after the 5th. On the 4th two out of ten immature females taken were in the second instar preceding maturity, the others being in that immediately preceding maturity. All immatures taken on the 5th (four) were in the instar preceding maturity.

The brown phase was specifically noted in the field, and one immature female taken August 4 is distinctly representative of this type. Both color phases were taken under the same conditions and at the same time.

Specimens examined: 177; 57 ♂, 85 ♀, 12 immature ♂, 23 immature ♀.
HONDURAS: Cantarranas, Rio Choluteca, Department of Tegucigalpa; elevation

2200 feet; July 19–20 and August 2–9, 1930; (Academy-Emlen-Worth Expedition; J. A. G. Rehn, J. T. Emlen, Jr. and C. Brooke Worth); 56 ♂ *type* and *paratypes*, 84 ♀ (*allotype* and *paratypes*), 12 immature ♂, 23 immature ♀; [A. N. S. P.]. Minas de Oro, Department of Comayagua; (J. B. Edwards); 1 ♂, 1 ♀; [Mus. Comp. Zool.].

EPISACTUS Burr

1893. *Epeisactus* Brunner, Ann. Mus. Civ. Stor. Nat. Genova, XXXIII, p. 115. (Invalid, no type species described or properly indicated.)

1899. *Episactus* Burr, Anales Soc. Españ. Hist. Nat., XXVIII, pp. 94, 254, pl. viii, figs. 3, 3a.

1903. *Parepisactus* Saussure, Revue Suisse de Zoologie, XI, p. 88. (Not of Giglio-Tos, 1898.)

GENOTYPE (by monotypy): *E. brunneri* Burr.

Brunner's use of this name cannot be maintained as a valid nomenclatoral proposal, even though it is clear that he applied the generic name to the same species, and the same material, later described in acceptable form by Burr. In the absence of any accompanying definite specific name or names, *Epeisactus* Brunner does not qualify, and Burr's name, accompanied by a specific name and description, must be used.

How distinct from *Episactus* is Giglio-Tos' genus *Parepisactus*,[14] based on his *P. carinatus* from Pun, "Ecuador,"[15] remains to be determined. The features of difference given in the literature are not wholly convincing, and are made more uncertain by the rather loose and contradictory character of the diagnoses of *Episactus* given by both Brunner and Burr, with which Giglio-Tos compared his new genus. Although *Parepisactus* is not represented in the extensive series of Neotropical Acrididae now in hand for study, we feel it is a valid generic entity, not present in Central America, with a more generalized abdominal structure in the male than that of *Episactus*, judging from Giglio-Tos' de-

[14] Bollett. Mus. Zool. Anat. Comp. Univ. Torino, XIII, no. 311, p. 36, (1898).

[15] This locality will not be found in even the best general atlases. It is in a district now generally regarded as part of Colombia, on the Rio Pun, one of the head streams of the Rio Cófanes, a tributary of either the Rio Napo or the Rio Putamayo (not Rio Caquetá as said by Festa), about twenty-five kilometers southeast, in an air-line, from Tulcan, in the Altos de Boliche. The position of Pun is approximately 77° 25′ W., 0° 37′ N. From photographs given by Festa it is seen to be in the subtropical mountain cloud forest. See E. Festa, "Nel Darien e nell' Ecuador." 1909. Turin.

scription. The other features given as differential by Giglio-Tos apparently are of doubtful or no value generically. Saussure's use of *Parepisactus* was doubtless occasioned by the hazy and unconvincing diagnoses of *Episactus* presented by the previous authors. All the material Saussure had was of the female sex, while all previously recorded of either *Episactus* or *Parepisactus* was a male or so of each.[16] Under the circumstances he was compelled to make a more or less arbitrary assignment of the three females before him from two different areas. That he failed to distinguish two distinct species is shown on a following page.

The genera *Episactus* and *Lethus* constitute a well defined assemblage, presumably of considerable antiquity, breaking up into a number of localized and highly specialized species. When compared with *Lethus* the genus *Episactus* is found to be closely related, but separable by a number of features in addition to the more obvious ones mentioned in the generic key. The body in the female sex of *Episactus* is never as strongly compressed and as deep as in that sex of *Lethus*, neither is the surface as heavily rugulose. The ovipositor in *Episactus* is less specialized in the structure of the valves, and never as scissor-like as in *Lethus*. The species *Episactus eremites* indicates in a number of features the line of transition to *Lethus*, possessing the same type of thickened lateral sections of the distal margin of the ultimate sternite (subgenital plate) of the male, pronounced though broad median production of the same margin, and the reduction of the larger median tooth on the ventro-internal margin of the ventral ovipositor valves. Against these tendencies toward *Lethus* the same species shows a type of ultimate sternite (subgenital plate) in the male which is a logical development of that found in the other species of *Episactus*, and is not of the digitiform spinigerous type found in *Lethus*, while the ovipositor jaws are not as compressed or scissor-like as in the latter genus. The bodily form of *eremites* is as a whole that of *Episactus*, and the position of the species is clearly in that genus, although exhibiting a tendency toward *Lethus*.

[16] Aside from the figured but unrecorded female given in the Biologia Centrali-Americana by Bruner. *Vide infra.*

Generic features.—Apterous; body subcompressed, particularly in female. Surface glabrous (in *eremites*) or subglabrous to micro-shagreenous. Fastigium transversely arcuate to semicircularly arcuate, in profile subrectangulate to moderately acute produced; dorsum of fastigium and occiput weakly to distinctly medio-carinate; face oblique in profile, obsoletely or appreciably low arcuate between antennal bases; frontal costa sulcate, evenly narrowed between antennae. Antennae with ten to eleven articles, these appreciably broadening distad except for ultimate article, subdepressed except for proximal two. Pronotum subsellate but with dorsal line straight in profile; median carina marked, lateral carinae of the transversely tectate disk distinct and continuous or obsolete in part and represented merely by remnants; cephalic margin of disk truncate, caudal margin of same shallowly and broadly obtuse-emarginate; lateral lobes of pronotum slightly longer than deep; an oblique carination present and directed ventro-cephalad, variable in strength; ventro-cephalic angle of lobes rounded obtuse, ventro-caudal angle rectangulate, rounded to a variable degree. Mesonotum, metanotum and abdomen markedly and continuously carinate medio-longitudinally, appreciably to distinctly tectate dorsad. Fourth sternite of abdomen of male with or without a carinate node-like protuberance. Male with tenth tergite deeply and broadly emarginate meso-caudad; ultimate tergite (supra-anal plate) scutellate, acute, apex distinctly acute; male cerci tapering in proximal half, there straight, distal half incurved and sometimes weakly deplanate, apices slightly hooked; ultimate sternite (subgenital plate) subscaphiform, distal margin produced to a variable degree and obtuse-angulate to rectangulate in caudal aspect, margin of angulate section of margin with series of uncinate denticulations. Female with tenth tergite V-emarginate mesad; ultimate tergite (supra-anal plate) elongate acute-lanceolate; female cerci simple, acutely tapering; ultimate sternite (subgenital plate) either produced into an elongate, subrostrate distal portion, which is acute or trifid at the apex, or the little produced distal margin of the sternite is deeply elliptically bisemarginate with a trigonal production between; ovipositor valves elongate, with margins serrato-dentate except distal section of ventro-internal; ventral valves

ventrad with the proximal tooth on ventro-internal margin somewhat enlarged or enlarged and thickened on its internal side so that an appreciable but incomplete transverse ridge-like tooth is developed partly across the surface. Limbs slender; cephalic and median pair multicarinate; caudal femora moderately inflated proximad, slender distad, median carina finely serrulato-denticulate, genicular lobes and angles appreciably to bluntly spinose; caudal tibiae with internal spines longer than external; spurs as in *Gymnotettix;* tarsi as in latter genus.

Distribution.—The genus is known only from the mountains of the state of Chiapas, Mexico, an unspecified point in Guatemala and the more elevated central section of Costa Rica. It doubtless will be found in other suitable areas of the intervening portion of Central America, as well as in other parts of extreme southern Mexico. The only detailed information we have on the zonal distribution of the genus is from Costa Rica, where it is basically, but not exclusively, subtropical, while the Chiapas species, as far as present information goes, is probably subtropical.

Key to Species

1. Lateral carinae of pronotal disk obsolete or but brokenly present (female only). Ultimate sternite (subgenital plate) of male with dorsal angle of median section of distal margin obtuse. Ultimate sternite (subgenital plate) of female produced into an acute process, the immediate apex of which may be entire or finely tridentate.....2

   Lateral carinae of pronotal disk in both sexes distinct, continuous, carried caudad as well marked indications upon the dorsum of the abdomen. Ultimate sternite (subgenital plate) of male with dorsal angle of median section of distal margin acute. Ultimate sternite (subgenital plate) of female brief, broad, not produced, distal portion deeply bisexcavato-emarginate with a median acute production. (Chiapas, Mexico.).....*eremites* new species

2. Size larger (body length, ♂, 13.7 mm.; ♀, 18: length of caudal femur, ♂, 13; ♀, 14–14.5). Caudal femora proportionately longer, in female equal to about three-fourths of body length. Apex of male abdomen more longitudinal, less transverse; ultimate sternite (subgenital plate) of male more produced, distinctly surpassing[17] apex of ultimate tergite (subgenital plate) in distal extent. (Guatemala.).....*brunneri* Burr

[17] We are compelled to base this feature on Burr's original figure 3a of the apex of the abdomen. The ultimate tergite in not shown in that figure, evidently being strongly deflexed, but from the position of the cerci it is evident the ultimate sternite is much more extended distad than in *tristani.*

Size smaller (body length, ♂, 9.8–11.2 mm.; ♀, 15.1–17.4: length of caudal femur, ♂, 8.5–9; ♀, 9–10.5). Caudal femora proportionately shorter, in female equal to about three-fifths of body length. Apex of male abdomen shorter, more transverse; ultimate sternite (subgenital plate) of male less produced, but little surpassing apex of ultimate sternite (subgenital plate) in distal extent. (Elevated interior of Costa Rica.)..... *tristani* new species

Episactus brunneri Burr (Plate III, figs. 16 and 17.)

1899. *Episactus brunneri* Burr, Anales Soc. Españ. Hist. Nat., XXVIII, p. 254, pl. viii, figs. 3, 3a. [♂; Guatemala.]

1903. *Parepisactus saltator* Saussure, Revue Suisse de Zoologie, XI, p. 88. (In part.) [♀; Guatemala.]

It has been exceedingly difficult to determine the relationship of Burr's *brunneri*, Saussure's *saltator*, the Costa Rican species now described as *tristani*, the Chiapas *eremites* and the species here referred to the genus *Lethus*. This situation was largely due to the inadequacy of original descriptions and figures, the fact that the older species were based on opposite sexes, and the composite character of the original (female) material of *saltator*. The interpretation of the situation here presented is supported by all the information procurable on the historic material involved.

The unique type of *brunneri* was contained in the Brunner Collection, now the property of the Vienna Museum. The original description of *brunneri* indicates the species has in the male an apically obtuse ultimate sternite (subgenital plate) with the free margin denticulate. The figures in Burr's paper are crude and unreliable for exact details, but show a low, not strongly produced subgenital plate, with a distinctly denticulate margin. The text states the male subgenital plate is "large, elongate, incurved, apex obtuse, posterior (superior) margin denticulate," while in the key to the genera, following Brunner, the shape of this plate is said to be "lanceolate," The measurements indicate the caudal femora of the male are but faintly shorter than the body.

Saussure's *Parepisactus saltator* was based on three females, although but a single set of measurements was given. The entire geographical and similar data for these specimens are: "Costa-Rica; Guatemala (Mus. Genavense, Rodriguez, 3 ♀)." Dr. J. Carl, of the Museum d'Histoire Naturelle at Geneva, has very kindly re-examined for us the original Saussure material,

and supplied important notes and measurements which enable us to appraise the species properly. He writes, "There are not three but only two ♀ of this species in our collection: a greater one from Guatemala (Rodriguez) and a smaller one from Costa Rica, without any details concerning localities." Following this Dr. Carl gives the measurements of these two specimens, showing their rather marked size disparity. Continuing he states: "None of them, as you see, agree perfectly with Saussure's measurements, which may have been taken on (from) the third, now wanting ♀." It is evident from all of these measurements as given below and under *E. tristani*, that Saussure had three specimens, two from Guatemala and one from Costa Rica, and that the original measurements were taken from one of the former now missing, and clearly not from the single Costa Rican individual. In view of this it is fair to conclude that *saltator* was based chiefly on the two Guatemalan females, as in addition to the measurements the features, "Pedes gracillimi longiusculi. . . . Femora postica elongata" were drawn from them, and not from the Costa Rican female. The Costa Rican insect in both sexes is smaller and with proportionately much shorter caudal limbs, as shown in the foregoing key and the following description of *tristani*. Therefore we are restricting the name *saltator* to the female from Guatemala now contained in the Geneva Collection, the measurements of which are given below, and here placing the name as a synonym of *brunneri*.

We have seen no material of *brunneri*, but we are able to give sketch figures of the head of the female type of *saltator* as indicated above. We owe these drawings to the courtesy of Dr. Carl.

The genital characters of the male of *brunneri*, translated and paraphrased from Burr, are as follows: Tenth tergite[18] with caudal margin in middle deeply rectangulate excised. Subgenital plate (ultimate sternite) large, elongate, incurved, apex obtuse, distal (superior) margin denticulate. Cerci conical, robust, incurved, apex hardly ("vix") decussate. The whole apex of the abdomen was said to be rufous. Saussure in describing the female genitalia of *saltator* says the ultimate tergite (supra-anal plate) is minute,

[18] Burr calls this the supra-anal plate. The type probably has the ultimate tergite reflexed into the anal chamber, and so not easily seen.

elongate, trigonal; ultimate sternite (ultimate ventral segment) elongate, subcompressed, apically trigonal-acuminate and chestnut colored. The few ovipositor features given by Saussure are not specifically diagnostic.

The measurements (in millimeters) of the historic material of *brunneri* (and *saltator*), here referred to, are as follows:

	Length of body	Length of pronotum	Length of caudal femur
♂, Guatemala, *type* (ex Burr)...	13.75	3	13
♀, Guatemala, *paratype* of *saltator* (ex Saussure).....	18	3.5	14
♀, Guatemala, *type* of *saltator* (ex Carl in litt.).....	18	2.5	14.5

Nothing is known regarding the distribution of this species other than its occurrence in Guatemala. By analogy with *E. tristani* we would conclude it is a native of the highland district of the republic generally known as the "Altos." If so it probably inhabits the Subtropical Life Zone.

Episactus tristani[19] new species (Plate I, fig. 2; pl. III, figs. 18–23; pl. IV, figs. 24 and 26.)

1901. *Episactus brunneri* Bruner, Biol. Cent.-Amer., Orth., II, pl. ii, figs. 15, 15a, 16, 16a, 16b. (Figures of ♂ and ♀ only.)

1903. *Parepisactus saltator* Saussure, Revue Suisse de Zoologie, XI, p. 88. (In part.) [♀; Costa Rica.]

1906. *Episactus brunneri* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 802. [♂, ♀; Slope of Tablazo, Costa Rica.] (Not *E. brunneri* Burr.)

We have already discussed under *E. brunneri* the original material on which Saussure based *Parepisactus saltator*. Further comment here is not necessary, while the measurements of Saussure's Costa Rica female, as furnished by Dr. Carl, are given below. The figures by Bruner are clearly from a pair from Costa Rica, formerly in his collection and now before us as part of the Hebard Collection. No mention of these specimens is given in Bruner's text, which merely lists Burr's original reference and locality. The specimens considered by us to be the originals of these figures agree perfectly with the dimensions of the illustra-

[19] Dedicated to the memory of Prof. J. Fidel Tristán, late Director of the Museo Nacional de Costa Rica, investigator, teacher and friend, in affectionate remembrance of happy days and rare companionship in Costa Rica in 1923 and 1927.

tions, and the apex of the male abdomen is little different from the rather conventionalized illustration of the same area.

This species is distinctly smaller than *E. brunneri*, with proportionately shorter caudal limbs, and the apex of the male abdomen is short, stubby and transverse, with the ultimate sternite (subgenital plate) quite brief and distinctly transverse, in both dorsal and distal aspects. Physical comparison with *brunneri*, not possible at this time, doubtless will show other features of difference.

Type.—♂; La Carpintera, Candelaria Mountains,[20] Costa Rica. Elevation, 6100 feet. September 4, 1923. (C. H. Lankester and J. A. G. Rehn; on foliage in cloud-forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5529.]

Size small (for group); surface micro-shagreenous. Head gently arcuate ascendent to fastigium as seen in profile: fastigium in dorsal aspect transversely arcuate, the length cephalad of the cephalic border of eyes equal to half width of fastigium at same point; median carinula distinct, surface of occiput somewhat rugulose; in profile fastigio-facial angle is faintly more acute than a rectangle; facial line in profile subconcave immediately ventrad of fastigio-facial angle, then broadly and shallowly convex to ventrad of eyes, thence straight oblique to ventral border of face; lateral facial carinae moderately diverging in dorsal half, subparallel in ventral half; frontal costa distinctly sulcate throughout, more shallowly so at dorsal extremity, the bounding carinae faintly converging ventrad to paired ocelli, thence subparallel and closely placed to the median ocellus, faintly and subsinuously diverging ventrad of same. Eyes moderately prominent, in outline subovoid, somewhat deplanate cephalad, greatest length equal to one and one-half times the infraocular depth of genae. Antennae[21] subequal to length of face; second article but half length of first; the incrassation affects solely the four distal articles, those distad of the second evenly thickening until the more incrassate section is reached.

Pronotum subcompressed, dorsum appreciably tectate with each side of the tectation subconcave; median carina decided, nearly straight in profile; lateral carinae of disk very faintly diverging caudad, less decided than median and more subinterrupted; dorsum of pronotum narrow, its width at cephalic margin faintly more than half of the median length of the disk (as 20 to 38): lateral lobes moder-

[20] This locality is the nearest shoulder of the mountains immediately southwest of El Alto, where the railroad and highway between Cartago and San José cross the continental divide. La Carpintera, while part of the Candelaria Mountains which rampart the Meseta Central on the south, is actually one of the most northern points of the great Cordillera de Talamanca massif. In 1923 the summit of La Carpintera was still covered with Subtropical Zone cloud-forest.

[21] Lacking in type. These characters are taken from paratypic males.

ately longitudinal, greatest dorsal length of same to caudal depth as 40 to 35; surface of lateral lobes with a weak oblique substrumose carina directed ventro-cephalad in the section cephalad of the principal transverse sulcus, latter deep but failing to reach the vicinity of the ventral margin or to sever the lateral carinae of the disk, several nearly obsolete lunate ridges cephalad of principal sulcus and dorsad of the oblique carina, while caudad of the same sulcus and parallel to the lateral carinae of the disk is placed a short but marked accessory carina; sulcus paralleling caudal margin of lobes distinct and more extensive than principal one. Mesonotum, metanotum and more proximal abdominal tergites with low and progressively evanescent analogs of the lateral carinae of the pronotal disk accompanying the sharply decided and tectate median carina, which is distinctly indicated distad to the ninth tergite. Prosternum with a transverse carinate ridge; mesosternum with interspace strongly transverse, shallow, caudo-lateral bordering angles oblique and rounded; metasternum with interspace small, triangular, bifoveolate, caudal margin of metasternum otherwise transverse concavo-truncate.

Tenth abdominal tergite of male mesocaudad transversely subcuneate emarginate, proximal border of emargination truncate, lateral sections of border markedly oblique divergent to the bounding lateral angles, which are briefly produced, decurved and with a number of shagreenous points: ultimate tergite (supra-anal plate) of male scutellate, lateral margins sigmoidally convergent to the acute, subrostrate apex: cerci of male relatively heavy, of the type described for the genus, incurving of distal half sharp and decided, its axis (at apex) forming a right angle with that of proximal half; apex with a slight apical tooth and immediately ventrad of same another similar tooth: ultimate sternite (subgenital plate) of male relatively short, but with its distal margin appreciably elevated and produced into a structure nearly rectangulate in outline as seen in caudal aspect, its ventral surface distad weakly but distinctly carinulate medio-longitudinally, the free margin broadly and very evidently uncinato-denticulate, these spaced teeth filling the whole distal margin except for brief marginal concavities immediately laterad. Production of fourth abdominal sternite distinct but low, carinato-tectate, more decided distad.

Cephalic and median limbs of medium length, with the carinations quite decided. Caudal femora with their apices surpassing that of the abdomen by about the combined length of the head and pronotum, in form these femora are slender, the depth of the proximal bullation contained nearly six times in the femoral length; all three dorsal carinae, the main ventral and the ventro-external carinae are serrulato-denticulate, the teeth more spaced on the ventro-external and larger and more pronounced on the lateral dorsal ones.

Allotype.— ♀ ; Las Cóncavas, southeast of Cartago,[22] Costa Rica. Elevation, 4550 feet. July 23, 1927. (C. H. Lankester

[22] This is the name of a coffee finca or plantation four or five miles southeast of Cartago. It is close to the village of Dulce Nombre, and southwest of Paraiso. The radio towers at El Rádio, near the railroad, and beyond them the Volcano of Irazú, are almost due north.

and J. A. G. Rehn; on weeds along road through coffee.) [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the male in the following noteworthy respects.

Eyes less prominent than in male, in profile more attenuate and distinctly more acute dorso-cephalad, greatest length but slightly greater than infra-ocular depth of genae. Antennae slightly shorter than in male.

Pronotum with dorsum more simply tectate in section: median carina distinct but less pronounced than in male; lateral carinae of dorsum represented solely by disconnected vestiges of papillose character, disposed in the same general fashion as the continuous carinae of the male. Mesonotum, metanotum and more proximal abdominal tergites virtually lacking any indication of lateral carinae.

Ninth and tenth abdominal tergites bearing mesad a longitudinal incised sulcus, which on the tenth distad becomes a small, quite narrow, triangular emargination of the distal margin: ultimate tergite (supra-anal plate) elongate, narrowly lanceolate, in length hardly surpassing the apices of the infra-cercal plates, the apex narrowly rounded, the dorsal surface excavate in two concavities, the proximal larger and deeper than the distal: cerci of the female simple, styliform, tapering, apices slender and acute: ovipositor valves subcompressed; dorsal valves with dorso-external margin with marked but in part slender teeth, dorso-internal margin with small, irregularly disposed teeth on distal half, proximal section without teeth; ventral valves with ventro-external margin having two or three of the more distal teeth relatively large and robust, ventro-internal margin of ventral valves with a single marked median tooth, which is transversely disposed and covers about half the width of the ventral surface which it divides into two planes, the distal moderately concave; ultimate sternite of female (subgenital plate) with its caudal margin produced mesad into a marked subtrigonal rostration, which has its lateral margins broadly concave, its apex but little broader than a single ventral ovipositor valve and abruptly trifid, the three small teeth of equal length.

Caudal femora with their apices reaching but hardly surpassing the abdominal apex, their greatest depth contained five and one-fifth times in the greatest length of the femora; serration of the carinae of the caudal femora less decided than in the male.

Coloration.—It is evident from the material before us that this species is dichromatic in addition to showing definite intensive and recessive extremes in at least one of the phases.

The rarer color phase is apparently a markedly bicolored one, in which the whole dorsal surface from the fastigium to the apex of the abdomen is sharply contrasted with the sides of the insect. In this phase (which is represented by a single female from the Rio Reventado) the pale dorsal bar, limited on the pronotum to the disk and on the abdomen to a somewhat broader but sharply

defined area, is cinnamon-buff to light ochraceous-buff, on the thoracic nota and the proximal abdominal tergite somewhat paler along the lateral borders; the remainder of the body in this phase ranges from dull russet on the head to mummy brown on the sides of the thoracic and abdominal segments, the venter of the abdomen pale cinnamon, this distad approaching the pale dorsal area and thus progressively narrowing the dark side areas of the abdomen; eyes prout's brown; limbs cinnamon-brown to mummy brown, the latter chiefly evident on the more inflated portion of the caudal femora.

The coloration of the other phase ranges from a pale recessive extreme with a nearly uniform coloration of cinnamon to sayal brown, to an intensive one in which the base tone is mummy brown, on the sides of the body darkened to blackish fuscous, the face (except ventral section of frontal costa), prosternum, cephalic coxae and some blotching on the caudal femora mikado brown, the cephalic and median limbs and ovipositor valves, basically tawny-olive, blotched or dotted with mummy brown, the venter of the abdomen sayal brown, darkening on the ultimate sternite (subgenital plate). A superimposed pattern of paired pale narrow cinnamon bars is also found in certain individuals of the intensive type, these extending on the dorsum of the thoracic nota and the more proximal abdominal tergites as closely placed parallel but well separated lines, in the same position as the external sections of the broad dorsal pale band described above for the single bicolored specimen examined. All the males seen, and all the females except the bicolored one and the very intensive extreme, have the ventral half of the lateral lobes of the pronotum sharply and uniformly pale cinnamon-buff. We have seen the bilineate condition only in the male sex, and in addition to the features given above that sex invariably has the abdominal apex (i. e. everything distad of the eighth segment) solidly vinaceous-rufous.

Between the intensive and recessive extremes above described the limited series before us shows distinct immediate conditions, in which the pale base color is progressively infuscate by traces of dark lateral bars, either as washes or as scattered markings.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Tucurrique	12	1.68	9
♂, Tablazo	11	1.76	8.5
♂, La Carpintera, *type*	11.2	1.68	9
♀, Cachí	15.2	1.93	10
♀, Tablazo	12.8[23]	1.76	9
♀, Las Cóncavas, *allotype*	17.4	1.84	10.5
♀, Rio Reventado	16	1.68	9.2
♀, Tres Rios	15.1	1.84	9.1
♀, Alajuela	15.8	2.01	10.5

Paratypic Series.—We consider all the specimens of this species seen as paratypic.

Morphological Notes.—There is some variation in the number and strength of the uncinate denticulations on the distal margin of the ultimate sternite (subgenital plate) of the male. These are much fewer, more spaced and smaller in the Tucurrique male than in the others seen.

Distribution.—This species, as far as known, is limited in its range to the more elevated, interior section of Costa Rica, ranging as high as 6100 feet (La Carpintera) and as low as 3000 feet (Tucurrique) on the Atlantic slope and 3100 (Alajuela) on the Pacific side. Nothing is known regarding the extent of the range in the more elevated central areas to the north and south of the limited section represented by available material.

Biological Notes.—At Las Cóncavas and Aserrí, *tristani* was taken on weeds and low cover along roads through coffee trees, while at La Carpintera it was on undergrowth foliage in mountain cloud-forest with many tree ferns and bromeliads. No habitat notes are available for any other individuals of the species.

The material before us shows the species occurs adult as early in the year as April 22 (Alajuela) and as late as September 4 (La Carpintera). We have no information as to its presence during the dry season.

Specimens examined: 12; 5 ♂, 7 ♀.

COSTA RICA: Tucurrique; elevation, 700 meters; V 15, 1928; (M. Valerio); 1 ♂

[23] The apex of the abdomen is curved dorsad, and the body length is consequently shorter than normal.

(*paratype*); [A. N. S. P.]. Cachí; (H. Rogers); 1 ♀ (*paratype*); [Hebard Cln.].[24] Tablazo; elevation, 1350 meters; (P. Biolley); 1 ♂, 1 ♀ (*paratypes*); [A. N. S. P.].[25] La Carpintera, Candelaria Mountains; elevation, 6100 feet; IX, 4, 1923; (Lankester and Rehn); 1 ♂ (*type*); [A. N. S. P.]. Las Cóncavas, southeast of Cartago; elevation, 4550 feet; VII, 23, 1927; (Lankester and Rehn); 1 ♀ (*allotype*); [A. N. S. P.]. Aserrí; elevation, 4800 feet; VIII, 2, 1927, (Rehn); 1 ♂ (*paratype*); [A. N. S. P.]. Rio Reventado on Volcan de Irazú; elevation, 5000 feet; V, 24, 1909; (P. P. Calvert); 1 ♀ (*paratype*); [A. N. S. P.]. Tres Rios; V, 3, 1924; (J. C. Bradley); 2 ♀ (*paratypes*); [Cornell Univ.]. Alajuela; IV, 22, 1916; (A. Alfaro); 1 ♀ (*paratype*); [A. N. S. P.]. "Costa Rica"; (Underwood); 1 ♂ (*paratype*); [Hebard Cln.].[26]

Episactus eremites[27] new species (Plate IV, figs. 25, 27–33.)

As shown above this species is an aberrant member of the genus, with a decided tendency toward the genus *Lethus*. The very distinctive characters of the ultimate sternites (subgenital plates) of both the male and female alone will serve to indicate the species, although the presence of definite lateral carinae on the pronotal disk in both sexes, with marked continuations of the same carried over much of the dorsum of the abdomen, and glabrous or even polished areas of the lateral lobes of the pronotum and the sides of the abdomen in the male, will be found of almost equal diagnostic value.

Type.— ♂; San Cristóbal, State of Chiapas, Mexico. Elevation, 2300 meters. July 7, 1926. (A. Dampf.) [Hebard Collection, Type no. 1248.]

Size rather small (for group): surface subglabrous on the dark colored lateral areas of the pronotum, mesonotum, metanotum and abdomen, remaining surfaces all smoother than in related species.

Head as seen from dorsum with fastigium projecting cephalad of eyes a distance equal to one-half the width of same between eyes (as 8 to 16), the even arcuate outline very faintly flattened mesad and uniformly cingulate, the margining carinulations continued caudad about the eyes, the subincrassate median carinula joining the marginal border; surface of fastigium and of occiput otherwise transversely rugulose: frontal costa narrow, sulcate and brief, faintly expanding dorsad of paired ocelli, there progressively less deeply sulcate than in interantennal

[24] This specimen came from the Bruner Collection and may have served as one of the originals for Bruner's figures of *brunneri* mentioned at the head of the specific treatment.

[25] This is the material recorded as *brunneri* by Rehn in 1906, to which the reference is given above.

[26] See footnote 24 above.

[27] From ἐρημίτης, *a hermit*, in allusion to its mountain habitat.

region: accessory facial carinae but weakly converging dorsad in dorsal half: eyes moderately prominent, acute subovoid in basal outline: antennae damaged.

Pronotum with dorsal surface appreciably tectate in cross section, relatively narrow, the greatest (caudal) width of this area but slightly greater than half dorsal length of pronotum (as 28 to 50); median carina marked, continuous, more tectate than carinate; lateral carinae of pronotal disk distinct, low carinate, continuous, virtually entire, weakly sinuate but faintly diverging caudad; cephalic margin of dorsum arcuato-truncate, caudal margin with median emargination very shallow and not strongly marked: lateral lobes somewhat longer than greatest caudal depth (as 50 to 35); cephalic margin oblique subarcuate, ventro-cephalic angle broadly obtuse, ventral margin suboblique, weakly sinuate, ventro-caudal angle narrowly rounded rectangulate, caudal margin straight; surface of lateral lobes crossed obliquely ventro-cephalad, from vicinity of caudal fourth of lateral carinae of disk to slightly dorsad of ventro-cephalic angles of lobes, by a distinct cicatriform ridge, thickening ventro-cephalad and cut solely by a single transverse sulcus, which dorso-ventrad crosses the middle of the lobe but is not indicated on the disk, nor does it cut the lateral carinae of the disk. Mesonotum and metanotum in general conforming to the abdominal structure; caudal margin of former broadly obtuse mesad, of latter transversely truncate as with most of the abdominal segments.

Abdomen with tectation of tergites pronounced, particularly on the six proximal tergites preceding the clavation of the abdominal apex, in the same section the compression of the abdomen and adjacent thoracic terga and pleura is marked and unusual, the continuations of the lateral carinae of the pronotal disk also definitely cutting the dorsum off from the vertical side areas, these continuations becoming progressively obsolete distad; ventral surface of abdomen without indication of usual protuberance on fourth sternite; tenth tergite strongly transverse dorsad, median emargination very broad and shallow, obtuse-angulate with the base of the angulation transversely truncate, the emargination two-thirds filled by a membrane, lateral angles bordering emargination strongly obtuse, in no way specialized or armed, ventro-caudal angles of tergite beneath cercal bases moderately acute produced; ultimate tergite (supra-anal plate) relatively short, transverse trigonal, acute produced meso-distad; cerci moderately tapering, somewhat deplanate on internal surface particularly distad, distal half of cerci strongly but regularly incurved, apex blunt acute, external surface of distal half subcarinulate, in distal aspect the cercus is seen to be gently decurving distad; ultimate sternite (subgenital plate) transverse, with an erect median recurved trigonal process, slightly shorter than its width proximad, its distal margin with the angle in general rectangulate, the apex without a distinct spine and the margins of process laterad with recurved low but distinct and regular serrulations, the teeth ending abruptly where the lateral margins arcuately pass into the dorsal margin of the main portion of the sternite, which margin is broadly flanged but unarmed, surface of median production of ultimate sternite with a median subtectate ridge becoming obsolete proximad.

Mesosternum with cephalic margin broadly arcuate, the interspace strongly transverse, meso-caudal portions of lobes broadly and obliquely arcuate excised. Metasternum with margin over foveolae rectangulate emarginate, remainder of margin nearly transverse.

Cephalic femora one and one-fourth times as long as the pronotal dorsum, carinations little evident except dorsal pair; median femora faintly longer than cephalic, slightly more robust, carinae similar. Caudal femora about four-fifths as long as the body, apices surpassing the extremity of the abdomen by more than pronotal length, moderately slender, margins not at all appreciably serrulate, pattern of the external paginae shallowly impressed; caudal tibiae with short spines of external margin numbering twenty, biseriate spines of internal margin all longer, sixteen in number, the last four of equal length, slightly closer together than the others of the same margin; caudal metatarsi slightly longer than remainder of tarsi, with three to five spines on internal and five on external dorsal margin, those of internal reaching less proximad than the external series.

Allotype.— ♀ ; Same data as type. [Hebard Collection.]

Differing from the above description of the male sex in the following noteworthy features.

Size larger: surface less glabrous and duller than in male.

Heads in profile with fastigio-facial production somewhat more emphasized than in male, subrostrate; accessory facial carinae slightly more distinctly convergent dorsad than in male: eyes with dorso-cephalic angle, as seen in lateral aspect, nearly rectangulate. Antennae entire: in length slightly shorter than face, somewhat broadening progressively from the third to the sixth, thence to apex subequal in width except for the apical narrowing of the ultimate article, from third distad the articles are subdeplanate dorsad, the same articles individually narrowing proximad as seen from dorsum.

Pronotum with dorsum slightly broader than in male, the caudal width of same equal to about four-sevenths of the length of the dorsum; median carina less elevated than in male, the lateral halves of the dorsum less concavo-tectate and more truly tectate in cross-section; caudal margin of disk slightly more deeply and sharply emarginate than in male: lateral lobes faintly more quadrate than in male, greatest (dorsal) length to caudal depth of lobe as 60 to 52; ventro-cephalic angle more broadly arcuate than in male; oblique carina of lobes present as in male but less sharply marked, and the surface in neighborhood of its dorso-caudal section and the adjacent portion of the lateral carinae is less inflated and less inclined to mask the lateral carinae of the dorsum.

Abdomen with tergites distad to and including the ninth distinctly tectate, the last with the tectation almost sublamellate in its differentiation from the main surface of the tergite; tenth tergite dorso-mesad subrectangulately emarginate to receive the base of the ultimate tergite (supra-anal plate), the latter being elongate acute lanceolate in shape, the apex acute with straight convergent lateral margins, the dorsal surface in its proximal two-thirds quite deeply concave, scutellate in shape with the parallel lateral and sigmoidally converging distal margin sharply defined and elevated, surface of distal third subdeplanate and extending

proximo-laterad some distance about the periphery of the rim-like margins of the more proximal area: cerci rather elongate, reaching distad as far as apex of the ultimate tergite, styliform, tapering, apex very acute and faintly decurved: ovipositor valves much compressed, distinctly deeper than broad, dorsal surface of dorsal valves narrow, particularly proximad, the surface concavity of the distal section pronounced, marginal teeth of dorsal margins as a whole rather small, internal margin with proximal unspined area less than half of the entire marginal length; ventral valves with ventro-external margins having four to five broad teeth separated from the apical hook by a diastema with three or so crenulato-denticulations, ventro-internal margins with low teeth except for the proximal one, which is larger, cusp-like, slightly thickened on internal side but not transversely disposed or sharply dividing the ventral surface of the valve: ultimate sternite (subgenital plate) but briefly produced distad, broad, distal margin broadly rounding from the lateral margins and between lateral blunt acute lobations is deeply bisemarginate into a pair of deep half elongate-elliptical concavities, each one and one-half times as deep as wide at broadest point, the production separating the two being an acute conical process reaching distad nearly to the apices of the lateral bounding lobes.

Metasternum with angle over foveolae more obtuse-angulate emarginate.

Caudal femora reaching briefly caudad of apex of abdomen.

Coloration.—Male. Base color tawny to russet, passing to ochraceous-tawny laterad on a broad, pale, subequal dorsal abdominal band, and paling to yellow ocher on the ventral surface of the body and to yellowish citrine on the ventral surface of the cephalic and median femora. Genae, most of lateral lobes and broad lateral bars on the mesonotum and metanotum and sides of the abdomen, becoming less solid and more nebulous near the apex, mummy brown to shining blackish fuscous. Head with face weakly flesh-color, occiput and fastigium mummy brown like the genae, eyes deep olive speckled with fuscous. Pronotum with narrow median area of dorsal tectation and its continuation over other nota and abdomen mummy brown, ventral third of lateral lobes of base color, diagonal carina strikingly reed yellow, particularly ventro-cephalad. Citrine of ventral surface reaching in a clouded condition to the ultimate sternite (subgenital plate). Caudal femora of general color, slightly clouded dorsad on external pagina, genicular extremity of same darkened; caudal tibiae and tarsi of general color; distal extremity of all tarsi (i. e. arolium, claws and distal third of third article) solidly fuscous.

Female. Base color as in male but infuscation of mummy brown to blackish fuscous very general and covering almost all the

insect except the ventral surface which is dull tawny. The head is almost solidly dark, antennae included, the eyes dark grayish olive. The pronotum shows no pale markings except fine pale pencillings of the lateral carinae of the dorsum and the oblique carina of the lateral lobes. The dorsal bar of the other nota and the abdomen is indicated by structure and pencilled continuations of the pale tone of the pronotal lateral carinae, while the ovipositor valves are tawny tipped with blackish. The cephalic and median femora are obscurely, the tibiae more distinctly cloud annulate with fuscous, the femora nearly solidly of this dorsad. Caudal limbs as in male but darker and all tarsi are similarly fuscous tipped.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, San Cristóbal, *type*.....	11.8	1.09	9.1
♀, San Cristóbal, *allotype*.....	20	2.52	11

This species is known only from the type and allotype. It is particularly interesting in that while the structure of the external genitalia of the male approaches that of *Lethus* more closely than in other *Episactus* species, that of the female is very different from the type found in any other known species of either genus. The surface of the integument in *eremites* is in part at least more glabrous than in any other species of the same genera, in fact more like that of *Gymnotettix*.

Distribution.—It is probable that the present species is limited in distribution to forest areas on the higher mountains of Chiapas, occupying there the same ecological niche as does *Lethus oresterus* in the mountains of south-central Honduras.

LETHUS[28] new genus

GENOTYPE: *Lethus oresterus* new species.

This genus is a member of the same complex as *Episactus* Burr and *Parepisactus* Giglio-Tos, and its line of divergence from the former is apparently indicated by *Episactus eremites*, as discussed elsewhere.

The main features of difference from *Episactus* have been set

[28] From Λήθος, *a Pelasgian prince*, ally of Troy.

forth in the key to the genera, but they may briefly be summarized as the flask-like expansion of the frontal costa dorsad of a very definite construction of the same between the paired ocelli, the development of the ultimate sternite (subgenital plate) of the male mesad into a marked recurved digitiform, apically spinigerous, process, and the strongly compressed and scissor-like character of the ovipositor valves of the female, the ventral ones of which lack any pronounced tooth mesad on the ventro-internal margin of the ventral pair. The species of *Lethus* are also heavier, stockier and with shorter, thicker limbs than those of *Episactus*.

From *Parepisactus* Giglio-Tos,[29] which has already been discussed under *Episactus*, *Lethus* can be distinguished by the form and development of the ultimate sternite (subgenital plate) of the male, which is short, subglobose, apically truncate and unarmed in *Parepisactus*, and the incurved, hooked cerci of the same sex, while those of *Parepisactus* are cylindrical. The female sex of the sole species of the latter genus (*P. carinatus*) being unknown, it is not possible to determine at this writing what differential characters may be present in both sexes. We have seen no material of Giglio-Tos' genus.

Generic features.—Apterous. Body compressed, medio-longitudinally carinate from fastigium to apex of abdomen. Surface largely rugulose to subrugulose, dull. Fastigium arcuate as seen from dorsum, subproduced, transversely carinulate marginally; in profile fastigio-facial angle is brief but distinctly acute produced cephalad of inter-ocellar portion of the retreating facial line. Frontal costa sulcate throughout, constricted at paired ocelli, dorsad of same sharply broadened into a flask-shaped area. Pronotum with a distinct but small medio-caudal emargination; lateral carinae of disk not indicated other than as broken and obsolete remnants: lateral lobes of pronotum subquadrate, ventral margin suboblique, ventro-cephalic angle obtusely angulate to broadly rounded, ventro-caudal angle distinct, rectangulate. Apex of abdomen of male[30] moderately recurved, subclavate; tenth tergite of male transversely emarginate mesad, ventro-lateral angles of same tergite acute produced; ultimate tergite

[29] Boll. Mus. Zool. Anat. Comp. Torino, XIII, no. 311, p. 36, (1898).

[30] Female sex alone known in *L. maya amrami*.

(supra-anal plate) trigonal, apex acute produced; cerci of male tapering styliform, regularly incurved in distal half, apex acute; ultimate sternite (subgenital plate) of male mesad produced dorso-cephalad in a recurved digitiform process extending to and between the cercal apices, apex acute with a single marked spine, proximad of apex the process bears a pair of lateral strongly diverging spines, and another similar pair near the base of the process or laterad of same on the concave portions of the distal margin of the main area of the sternite. Female with ventro-lateral angles of tenth tergite acute produced; ultimate tergite (supra-anal plate) acute produced: ovipositor valves elongate, compressed, scissor-like, evenly tapering in profile; dorsal pair with external margins regularly serrato-dentate, dorsal surface of dorsal valves subconcave or declivent ventro-mesad; ventral pair of ovipositor jaws with external margins serrato-dentate, internal margins similar and without decided specialization or disposition of any particular teeth, ventral surface not broken into two distinct planes: ultimate sternite (subgenital plate) produced disto-mesad, narrowed apex obtusely angulate, transverse truncate or subconcave, in each case with a median trigonal point. Cephalic and median femora carinate; caudal femora with dorsal carinae weakly serratulate; caudal tibiae with spines of internal margin biseriate in length, except immediately distad where they are crowded and uniform in length; caudal metatarsi with both dorsal margins spaced serrato-spinose.

Distribution.—The species of *Lethus* occur in apparently localized habitats in the state of Chiapas, extreme southern Mexico, northern Guatemala and northern and central Honduras. At least one of the species is strictly a montane form, apparently restricted to the Subtropical Life Zone, while the other one, with two subspecies, occurs under more truly tropical conditions, with one of its forms (*L. maya maya*) reaching as high as 3000 feet in north-central Honduras. Doubtless further work will show the genus present, in suitable environments, over much of the southern third of Mexico—probably that section below the Isthmus of Tehuantepec—as well as suitable areas of El Salvador and Nicaragua. We question its reaching Costa Rica, although such is possible. The absence of the genus, as well as *Gymnotettix* and

Episactus from the many collections made in southern Mexico north of the Isthmus of Tehuantepec would indicate their absence from that area. This probably can be explained by the geological history of the country involved. As Schuchert has pointed out[31] the "Tehuantepec portal" was open probably during the Upper Miocene and certainly in the Early Pliocene, and in consequence the entire Mexican tableland area was then separated by sea from the old land mass of northern Central America. The Episacti in Central America is clearly an ancient group, while the Eumastaces we would consider a much more recent arrival from South America, where they have reached an extraordinary diversification.

Key to Species

1. Form more decidedly compressed. Fastigio-facial production of female, as seen in profile, extending cephalad of dorso-cephalic angle of eyes a distance equal to slightly more than half greatest width of eye. Face of female ventrad distinctly flattened, accessory facial carinae prominent ventrad, more elevated than borders of frontal costa. (Petén Department, Guatemala.) ..... *maya amrami* new subspecies

   Form less strongly compressed. Fastigio-facial production of female, as seen in profile, extending cephalad of dorso-cephalic angle of eye a distance equal to little, if at all, more than one-third greatest width of eye. Face of female ventrad not distinctly flattened, accessory facial carinae no more prominent ventrad than borders of frontal costa 2

2. Ultimate sternite (subgenital plate) of male with median production cuneate in caudal aspect, evenly narrowing distad, apical spine distinct but not greatly prolonged; lateral margins of production with two pairs of spaced spines, one near apex, the other near base. Lateral angles of disto-median production of ultimate sternite (subgenital plate) of female acute, subspiniform, but slightly less evident than median point. Size smaller (average body length, ♂, 15.6 mm.; ♀, 20.9). (Chiapas, Mexico and north-central Honduras.) ..... *maya* new species

   Ultimate sternite (subgenital plate) of male with median production narrower, sublanceolate, lateral margins of same concave to subparallel, but little narrower at distal third than at proximal third, apical spine greatly prolonged, aciculate; lateral margins of production with a single pair of elongate, aciculate diverging spines at distal third, more proximal pair of spines not on margins of process but situated on the concave lateral portions of the true distal margin of the tergite.[32] Lateral angles of disto-median production of

[31] Bull. Geol. Soc. Amer., XL, p. 357, figs. 8 and 9, (1929).

[32] Rarely these are absent or subobsolete.

ultimate sternite (subgenital plate) of female rectangulate but non-spiniform. Size larger (average body length, ♂, 16.7; ♀, 25.5). (South-central Honduras.) ..... *oresterus* new species

In a linear arrangement we place *L. maya* first, and nearer in position to the genus *Episactus*, while *L. oresterus*, which is clearly the most divergent form, would in consequence come last at the other end of the series.

Lethus maya[33] new species (Plate IV, figs. 34–41.)

This species needs comparison solely with *L. oresterus*. It averages somewhat smaller, but shows a basically similar type of specialization of the ultimate sternite (subgenital plate) of the male. The proportions and details of the production and the marginal spination of this sternite, however, are different, as shown in the key to the species and the accompanying figures. In the female sex the external ovipositor margins of typical *maya* are more stoutly toothed and the lateral angles of the median production of the ultimate sternite (subgenital plate) are marked and subspinose, instead of rectangulate and unspined.

Type.—♂; Tuxtla Gutierrez, State of Chiapas, Mexico. June 6, 1926. (A. Dampf.) [Hebard Collection, Type no. 1249.]

Size medium; form moderately compressed; surface as a whole closely microshagreenous, subrugulose on occiput and pronotum.

Head with occipital line ascending moderately to the fastigium as seen in profile; fastigium, seen from dorsum, broad, short, greatest proximal width equal to three times the length of the fastigium cephalad of the eyes, the outline of the fastigium broadly and evenly arcuate; medio-longitudinal carina of the fastigium and occiput distinct and continuous, peripheral border of fastigium carinulate, continued caudad about eyes; fastigio-facial angle blunt acute as seen in profile, but moderately produced; facial line but moderately oblique, subconcave briefly ventrad of fastigio-facial angle, thence very low broad arcuate convex, passing to the straight oblique ventral section of the face; frontal costa rather narrow, sulcate throughout but more deeply so between the paired ocelli, where the lateral margins are gently constricted and dorsad of which the margins are expanded in a small but definite flask-shaped area ventrad of the fastigium; accessory facial carinae distinct, subparallel on ventral half of face, dorsad moderately and sinuately converging: eyes subovoid in outline, sharply angulate dorso-cephalad, greatest depth equal to one and one-fourth times that of the infra-ocular section of genae (as 23 to 18).

[33] After the Maya people, whose structures in the Usumacinta Valley of Tabasco, Chiapas and adjacent Guatemala are giving to the world increasing information on their culture.

Antennae abbreviate, somewhat shorter than face, composed of nine articles, of the type usual in the group, the distal five subdeplanate dorsad.

Pronotum subsellate with dorsal line straight in profile, its length slightly greater than that of head: dorsum sharply tectate, with lateral halves strongly declivent from the sharp and carinate median ridge, passing into the sub-vertical lateral lobes without marked separation: cephalic margin of dorsum rotundato-truncate, caudal margin subtruncate with a small but distinct and sharp median rectangulate emargination; lateral lobes and adjacent portion of dorsum slightly deeper than long, cephalic and caudal margins subparallel, in general straight, the former rounded obtuse at the ventro-cephalic junction with the distinctly bisinuate ventral margin, which caudad is briefly straight to the rectangulate ventro-caudal angle; sole indications of lateral carinae are short detached rugae, the more prominent a brief, nearly longitudinal, arcuate one placed dorsad between the two distinct vertical sulci which cross the sides but not the dorsum of the pronotum, one mesad, the other near the caudal margin; oblique, low, subcarinate ridge extending diagonally ventro-cephalad to the ventro-cephalic angle as in related species.

Mesonotum, metanotum and eight proximal abdominal tergites distinctly tectate and sharply carinate medio-longitudinally, as on the pronotum. Tenth abdominal tergite distad broadly but shallowly concave emarginate, mesad the same concavity is flattened, while laterad, where it joins the juxta-cercal sections of the distal margin, is situated on each side a small tooth-like node, ventro-distal angle of tergite markedly produced and apically blunt acute; ultimate tergite (supra-anal plate) not separated from the preceding tergite by a distinct suture, but sharply so by contour, in form broad scutellate, slightly broader than greatest median length, its distal margin broad obtuse-angulate convergent with a median acute linguiform angulation, surface of tergite without marked sculpture, but laterad somewhat depressed toward cercal bases, and as a whole ventrad of the level of the tenth tergite. Cerci with proximal half straight, in dorsal aspect the same section is subequal in width, in profile the same area evenly narrows, distal half rather sharply curved at a right angle to the proximal portion, apex spiniform. Ultimate sternite (subgenital plate) with distal median production erect, wedge-shaped, narrowing evenly distad, the apex relatively broad and arcuato-truncate with a distinct erect median spine, a pair of longer, more slender spines are placed briefly proximad of the apical margin on the flange-like lateral margins of the process and directed latero-cephalad, while somewhat ventrad of this pair another similar but shorter pair of spines are situated, these directed slightly more dorsad; in profile the production of the sternite is seen to be erect subsigmoid, proximo-laterad with impressed, subconcave, reniform areas, while in caudal aspect the production shows three low ridges, one median, the others marginal, the area between shallowly channeled.

Prosternum transversely carinate; mesosternum with cephalic margin cingulate and broadly arcuate, interspace between lobes strongly transverse, the lobes in large part obliquely truncate distad, surface of mesonotum with a distinct, straight, transverse carination; metasternum rectangulate emarginate over foveolae, distal

margin subtruncate. Fourth sternite with a low medio-longitudinal thick subcarination.

Cephalic femora somewhat less than one and one-half times the dorsal length of the pronotum, the six carinae equally evident and all rather finely serrulate; median femora slightly longer than cephalic, carination of similar character. Caudal femora with their apices exceeding the tip of the abdomen by slightly more than the length of the pronotum, relatively robust in proximal inflation when seen in profile, subcompressed in dorsal aspect, greatest depth of femur contained four and four-fifth times in their length, carinae sharp and all finely serrulate, these often widely spaced; "herring-bone" pattern of the pagina sharply and regularly impressed: caudal tibiae with 21 to 23 spines on external margin, internal with 18 to 19 spines; caudal metatarsus equal to length of remainder of tarsus, each dorsal margin with five spines.

Allotype.— ♀ ; Same data as type. [Hebard Collection.]

The female sex differs from the above described males in the following noteworthy features.

Size somewhat larger than male; surface more distinctly multirugulose, although this is always of subtle character.

Head with fastigio-facial angle in profile slightly more produced and acute than in male, more truly subrostrate; facial line as in male but the concavity ventrad of fastigio-facial angle more emphasized and that section ventrad is but faintly arcuate and less oblique than in male; frontal costa no broader than in male, more sharply and strongly constricted between the paired ocelli; accessory facial carinae more distinctly converging dorsad; eyes in depth subequal to that of infra-ocular portion of genae. Antennae missing.

Pronotum with its dorsal length slightly greater proportionately than in male, a third longer than dorsal length of head, dorso-median carination marked and slightly but appreciably arcuate in profile; in lateral view the pronotum is proportionately deeper than in male, greatest length of whole pronotum one and three-sevenths times greatest dorsal length of same.

Ninth abdominal tergite with a distinct, gutter-like medio-longitudinal sulcus; tenth tergite medio-dorsad completely and broadly rectangulate-emarginate, the borders of the emargination passing without angulation into the distal margin of the more lateral sections of the tergite, the caudo-lateral angles of which are elongate acute produced as in male; ultimate tergite (supra-anal plate) acute, sublanceolate, its dorsal surface divided into three areas by a pair of distad converging carinae, these areas being a moderately excavate, elongate scutellate section embracing the proximal three-fifths, a smaller distal section which is weakly impressed, and paired lateral, subvertical flattened areas beneath the overhanging carinae: ovipositor valves in dorsal aspect slender, rather deep in profile, appreciably compressed; dorsal valves with the serrate teeth of the external margin moderately spaced, about twelve in number, occasionally bifid, rather even in height, but shorter and less definite distad, internal margin with fewer, shorter, less definite serrato-dentations, lacking in proximal two-fifths of margin and very weak distad,

dorsal surface of dorsal valves ruguloso-deplanate, subexcavate distad; ventral valves with ventro-external margin bearing closely placed, biseriately sized teeth, becoming obsolete distad, internal margin with five to eight relatively short but sharp teeth proximad, none transverse in disposition, the margin distad without distinct teeth, ventral surface of ventral valves concavo-deplanate, not divided into two sections: ultimate sternite (subgenital plate) with disto-lateral angles broadly rounded rectangulate, median portion of distal margin briefly produced distad in a transverse structure with converging subconcave margins, which distad end in moderately acute angles, between which the terminal margin is transverse with a short but stout conical, spiniform process.

Limbs proportionately shorter and stockier than in the male, caudal femora reaching to but not surpassing the ovipositor jaws. Greatest depth of caudal femora contained four and one-half times in their length.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Tuxtla Gutierrez, Mexico, *type*	15.2	2.35	11.8
♂, Tuxtla Gutierrez, Mexico, *paratype*	16.1	2.26	11
♂, Subirana, Honduras	15.5	2.77	12.7
♂, Mataderos Mountains, Honduras	17.9	3.36	13.3
♀, Tuxtla Gutierrez, Mexico, *allotype*	20.5	2.91	11.3
♀, Tuxtla Gutierrez, Mexico, *paratype*	21.3	3.02	11.8
♀, Subirana, Honduras	25	3.69	15
♀, Mataderos Mountains, Honduras	23.2	3.44	13.2
♀, Progreso, Honduras	25.3	3.52	14.5

Coloration.—General color of male pale buckthorn brown to weak ochraceous-orange, becoming pale tawny or pale orange rufous on occiput and genae, overlaid with a pattern of dull fuscous of varying intensity as follows: pronotum infuscate except for paired longitudinal pale bars in the usual position of the lateral carinae, a lining of pale on the oblique carinae of the lateral lobes and a weakening of the overlying shade elsewhere on the lobes; other nota and abdomen infuscate dorsad, with the paired pale bars continued distad to the sixth tergite, where they become obsolete; sterna, abdominal venter and caudal femora except apices pale, unmarked; abdominal apex infuscate except for pale

cercal tips; cephalic and median limbs appreciably but unevenly infuscate, apices of the caudal femora, caudal tibiae and tarsi strongly infuscate; antennae infuscate, except for pale proximal article; eyes mottled dresden brown and fuscous.

General color of female dresden brown, heavily and in general almost solidly overlaid with mummy brown, the head showing much mottling of the two tones, as is true of all the limbs, although the apices of the caudal femora and most of the caudal femora are prevailingly dark; ventral surface uniformly dresden brown to tawny, except that the ultimate sternite is solidly mummy brown distad; eyes as in male.

Paratypic Series.—In addition to the type and allotype, we have before us a paratypic pair taken at the type locality by Dr. Dampf, July 17 (♂) and June 6 (♀), 1926. We have also before us a series of three males and six females taken at Subirana, Yoro Department, north-central Honduras, February 11 and 13 and March 14, 1933, by Stadelmann; six males and thirteen females taken at 3000 feet elevation in the Mataderos Mountains, near Subirana, Yoro Province, Honduras, February 13, 1933, by the same collector; and three females from Progreso, in the Sula Valley of northwestern Honduras, taken in August, similarly by Stadelmann. All of these Honduranian specimens are from the collection of the Museum of Comparative Zoology.

Distribution.—From the available material it is evident that true *maya* ranges over an extensive area reaching from western Chiapas, Mexico, to central Honduras, probably in its typical form limited to country of some elevation, passing at lower levels into the superficially quite different, but actually extremely close *L. maya amrami.* The latter is the more divergent member of the stock and apparently represents a relatively recent intrusion into lower, more truly tropical, levels, from the higher, geologically older territory inhabited by typical *maya.* The type locality, Tuxtla Gutierrez, is in the valley of the upper Rio Grijalva, which joins the Rio Usumacinta near its mouth. The elevation of the type locality is approximately 2000 feet above the sea.

It is probable that the marked penetration of the central area of Honduras by semi-arid tongues, presumably from the Pacific

side, which follow river valleys and spread over the Comayagua plain, has completely isolated the areas inhabited by the *maya* complex from that in which *L. oresterus* occurs.

Morphological Notes.—The series from Subirana and the adjacent Mataderos Mountains in Honduras is fully typical, while the females from the lower levels of the Sula Valley at Progreso show distinct tendencies toward *maya amrami*, the fastigium being more produced, the face slightly more retreating and subconcave, the disto-lateral angles of the ultimate sternite (subgenital plate) being less rectangulate and more rounded obtuse-angulate, while the median projection of the distal margin of the same sternite is less strongly tridentate. In these individuals the features as a whole are nearer those of true *maya* than of *m. amrami*, but the appreciable divergence exhibited by them indicates they are atypical *maya maya* and establishes the subspecific character of *m. amrami*.

The measurements given above demonstrate the considerable amount of individual variation found in the species. From present material the typical form is smaller in Chiapas than it is in Honduras, but the series from Subirana and the nearby Mataderos Mountains show the wide individual size range encountered in the latter country alone. As a whole the Mataderos Mountains males average larger than those from Subirana, although the females from the two localities are little different in size.

A number of the Honduranian males have the distal extremity of the process of the ultimate sternite (subgenital plate) injured, often lacking the terminal spine and with the extreme distal margin having a deep median indentation or even a shallow cleft. There is no uniformity to this malformation, and apparently it is due to injuries received in the instar preceding maturity or when in a teneral condition following the last ecdysis.

Specimens examined.—35; 11 ♂, 24 ♀:

MEXICO (CHIAPAS): Tuxtla Gutierrez; June 6 and July 17, 1926; (A. Dampf); 2 ♂ (*type* and *paratype*), 2 ♀ (*allotype* and *paratype*); [Hebard Cln.].

HONDURAS: Subirana, Yoro; February 11 and 13, March 14, 1933; (Stadelmann); 3 ♂, 6 ♀; [Mus. Comp. Zool.]. Mataderos Mountains, near Subirana, Yoro; elevation, 3000 feet; February 13, 1933; (Stadelmann); 6 ♂, 13 ♀; [Mus. Comp. Zool.]. Progreso, Sula Valley; August; (Stadelmann); 3 ♀; [Mus. Comp. Zool.].

Lethus maya amrami[34] new subspecies (Plate V, figs. 50–54.)

This subspecies represents an extreme development of the *Lethus maya* stock, with which it is apparently connected by intermediates occurring in suitable environments in the lower levels of eastern, more coastal Guatemala. Under the typical form we have noted that material from Progreso in the Sula Valley of northwestern Honduras, while referable to *maya maya* is atypical of that form, showing a very distinct tendency toward the present subspecies. From this we infer that virtual intermediates will be found in portions of eastern Guatemala.

From typical *maya* the subspecies *amrami* can be distinguished by the more marked rostration of the fastigium as seen in profile, and also less evidently in dorsal view, the more deplanate face, the prominence of the supplementary facial carinae, the more strongly arcuate pronotal dorsal profile in the female, the extreme compression of the ovipositor valves, the less strongly spinoso-dentate apex of the ultimate sternite (subgenital plate) of the female, and the more obtusely arcuate disto-lateral angles of the margin of the same as seen in profile. The male sex of *m. amrami* is, as yet, unknown.

Type.— ♀ ; Piedras Negras, Department of Petén, Guatemala. Elevation, 600 to 800 feet. July 30, 1933. (David W. Amram, Jr.) [Academy of Natural Sciences of Philadelphia, Type no. 5532.]

The features given in the description which follows are chiefly comparative with those already mentioned for the same sex of *maya maya*, or under *oresterus* which follows.

Size much as in *oresterus;* form more distinctly compressed than in *maya maya.*

Head with occiput less convex, more obliquely ascendant to the more sharply produced, subrostrate fastigium, which in profile shows a quite sharply acute fastigio-facial angle; from the dorsum the fastigium is seen to be narrower and more produced than in *maya maya,* subtrigonally arcuate in outline, the greatest width at cephalic angle of eyes being faintly less than twice the length of the fastigium cephalad of the same point (as 17 to 9), the bordering and median carinae of the fastigium as in the other species; facial line with the infra-fastigial concavity relatively marked and the section thence ventrad nearly straight oblique; face

[34] Named for its collector Mr. David Werner Amram, Jr., who secured the type and paratype of this form, as well as important material of *Gymnotettix occidentalis* reported on another page.

as a whole more flattened than in the other species, particularly ventrad and laterad toward the more decidedly elevated accessory facial carinae; frontal costa with its median half narrow, slightly more so than in *maya maya*, there deeply sulcate, the dorsal flask-shaped expansion of the lateral margins as in *L. oresterus*, while the ventral fourth of the costa has the lateral margins appreciably diverging ventrad; clypeus with a definite transverse median carinate angulation, the more proximal sections of the lateral margins of the clypeus sublamellate and joining the transverse carina. Eyes in depth subequal to the infra-ocular portion of the genae, in shape as in *oresterus*. Antennae missing.

Pronotum much as in *oresterus* except that it is more compressed, the dorsal line in profile is seen to be slightly more arcuate and the oblique carination on the lateral lobes is sharper and more elevated, and having at its ventro-cephalic extremity a low node-like protuberance, which is also the ventro-cephalic angle of the lobe margin. Structure of the mesonotum, metanotum and most of the abdominal tergites as in *oresterus*.

Ninth, tenth and ultimate abdominal tergites as in *L. oresterus*, except that the scutellate area proximad on the ultimate tergite (supra-anal plate) has its caudad converging margins straighter than in *oresterus:* ovipositor valves more slender in profile and more compressed in dorsal aspect than in *oresterus*, the ventral valves also straighter in lateral aspect than in typical *maya*, marginal armament much as in *oresterus* but teeth as a whole smaller and shorter. Ultimate abdominal sternite (subgenital plate) with its distal margin produced mesad into a short lappet-like area with an acute but short median spine, but without lateral angles or points as in the other forms,[35] the lateral borders of the production rounding to the distal margin of the same which is crowned by the low but distinct median point.

Cephalic and median femora slightly but distinctly more elongate than in *maya maya* or *oresterus*, somewhat more slender, particularly proximad. Caudal femora with their apices reaching to the tips of the ovipositor valves, in character as in *oresterus*; caudal tibiae with external spines numbering from twenty-two to twenty-four, internal spines twenty-one; caudal metatarsi with teeth on dorsal margins four to six in number.

Coloration.—General tone mummy brown to blackish fuscous, areas of an apparently base shade of ochraceous-buff present (paratype) or absent (type) on the head, pronotum and bases of the caudal femora, and of dull dresden brown on the other nota and thoracic sterna in both specimens. The type in color strongly resembles the dark phase of *oresterus* (described on a

[35] We are convinced that the condition of the extremity of the distal production of the ultimate sternite (subgenital plate) in the type and paratype is not fully normal, and that while the usual three angles or spines are almost obsolete, they may be present to some degree in the average female individual of the subspecies. It is possible, however, that the usual median point and the lateral angles of the production are uniformly as little evident as here described and figured, but this remains for the future to demonstrate.

subsequent page), the paratype is similar except for the pale areas which suggest, but in a reversal of tone, one of the color types seen in the same species.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♀, Piedras Negras, *type*.....	24.2	3.94	8.9
♀, Piedras Negras, *paratype*.....	24.5	3.44	8.9

In addition to the type we have before us a paratypic female bearing the same data. Except for the color features and the slightly shorter pronotum already noted this specimen shows no important differences from the type.

Lethus oresterus[36] new species (Plate II, fig. 3; pl. V, figs. 42–49.)

This inhabitant of Honduranian cloud-forest needs no further comparison with *maya*. In addition to the key to the species, the accompanying figures give the chief differential features of this most interesting species, concerning which we know more than of any other species of this genus or *Episactus*.

Type.—♂; Peña Blanca, above Rosario Mine, San Juancito Mountains, Honduras. Elevation, 5900 feet. July 22, 1930. (Academy-Emlen-Worth Expedition; J. A. G. Rehn.) [Academy of Natural Sciences of Philadelphia, Type no. 5530.]

Form and surface character as in *L. maya* except that body is slightly more robust; size slightly larger.

Head with general form as in *maya* but occiput slightly more transverse, the width at cephalic angle of eyes equal to two and one-half times the fastigial length cephalad of the same point, the curve of the fastigial outline slightly flattened mesad; fastigio-facial angle faintly more produced than in *maya*, facial line appreciably more retreating than in *maya*, with the infra-fastigial concavity deeper and more sharply indicated, while ventrad of the antennae the facial line is nearly straight oblique; frontal costa with dorsal flask-shaped area broader than in *L. maya;* accessory facial carinae as in *maya;* eyes proportionately longer than in *maya*. Antennae slightly shorter than in *maya*.

Pronotum in general as in *maya*, differing almost entirely in the ventral margin of the lateral lobes being less bisinuate cephalad, instead nearer straight oblique in that area. Mesonotum, metanotum and more proximal abdominal tergites as described under *L. maya*.

Tenth abdominal tergite broadly concavo-emarginate distad, the curvature of the same is regular and not flattened mesad as in *maya*, the single tooth-like node

[36] From ὀρέστερος, *dwelling in the mountains*.

situated on each side of the emargination quite small, deflexed, ventro-distal angle of tergite acute produced, but less prolonged than in *maya;* ultimate tergite (supra-anal plate) no more distinctly separated by a suture from the preceding tergite than in *maya*, but similarly by contour, the form also broad scutellate with a disto-median acute linguiform production, which is slightly decurved at the apex. Cerci in their entirety more regularly incurved than in *maya*, and lacking the hook-like flexure of the latter, the general character otherwise as in *maya;* apices blunt acute. Ultimate sternite (subgenital plate) with median production of distal margin narrower than in *maya*, evenly tapering to an elongate spiniform apex, the marginal spines consisting of one pair of heavy, elongate upcurved spines placed at the middle of the lateral margins of the process, toward the internal face of the same, the other pair of much smaller and less conspicuous spines placed on the lateral, cingulate sections of the distal margin distinctly laterad of the median production, directed cephalad; in profile the median production is seen to be strongly reflexed and directed dorso-cephalad, with the lateral sections of the distal margin bent arcuate and strongly sublamellato-cingulate; sculpture of dorso-caudal surface of median production as in *maya*. Fourth sternite with a similar but more elevated carination than in *maya*, the same obliquely bevelled distad.

Limbs as in *L. maya* except that greatest depth of caudal femora is contained five times in length of same; dorsal margins of caudal metatarsi each with five or six spines.

Allotype.— ♀ ; Same date as type but date is August 14, 1930. [Academy of Natural Sciences of Philadelphia.]

The female sex of *oresterus* differs from that sex of *maya* and the male of the present species, above described, in the following respects.

Size appreciably larger; surface similar.

Head with fastigio-facial angle in profile more produced than in *maya*, as in male sex; the infra-fastigial concavity of the facial line as pronounced as in the latter sex, the facial line ventrad of concavity nearly straight, the angle of inclination of same less oblique and the face more vertical than in the male; frontal costa with form as in male sex but interocellar constriction of same more marked; eyes in depth slightly greater than depth of infra-ocular portion of genae (as 24 to 21); antennae faintly longer than the face ventrad of same.

Pronotum differing from that of male sex in the same respects as the female of *maya* does from the male of that species, greatest caudal depth equal to one and nine-twentieths times greatest dorsal length of same; surface rugosities of disk chiefly low tubercles, usual oblique elevation on lateral lobes subobsolete, reduced remnant of lateral carinae of disk sharply bent arcuate.

Ninth and tenth abdominal tergites essentially as in *L. maya*, except, as with the male sex, the less prolonged acute production of the caudo-lateral angles of the tenth: ultimate tergite (supra-anal plate) essentially as in *L. maya* except

that the more proximal section has the lateral margins more straight convergent and the lateral subvertical areas less overhung by these carinae: ovipositor valves much as in *maya*, but in dorsal aspect with the dorsal pair slightly more arcuate and the armament of the dorso-external margin of the dorsal valves more numerous, more truly serrate and less dentate, passing into a mere cutting edge distad, internal margin of dorsal valves armed much as in *maya;* ventral valves essentially as in *maya*, teeth of internal margin becoming subobsolete distad: ultimate sternite (subgenital plate) as in *maya* except that the lateral angles of the produced portion are more rectangulate and the median production is more conical.

Limbs differing from those of the male sex in the same degree those of the female of *maya* differ from those of the male of the same species; greatest depth of caudal femur contained five times in the length of the same.

Coloration.—General base color of male ranging from light ochraceous-buff to nearly as dark as ochraceous-tawny, overlaid by a pattern of mummy brown as follows: a narrow medio-longitudinal line from the cephalic border of the pronotum to the apex of the abdomen, finely divided by a pale pencilling of the medio-longitudinal carina; broad subequal bands on the sides from the cephalic border of the lateral lobes of the pronotum to the abdominal apex, broken only by a pale lining of the oblique carina on the lateral lobes and the pale ventral section of the same. Head solidly pale except for the infuscation of the supra-antennal sections lateral of the frontal costa, which latter is pale throughout; eyes sepia mottled with mummy brown; antennae mummy brown except for the pale proximal article. Pleura pale, marginally in part pencilled with mummy brown. Apex of abdomen largely mummy brown, paling on venter of apex to brownish olive. Caudal femora pale becoming fuscous distad, the caudal tibiae and tarsi light brownish olive, the extensor surface, most of proximal section and a varying amount of the remaining areas heavily infuscate, spines light brownish olive, fuscous tipped. Cephalic and median limbs strongly infuscate, the femora showing more clear light brownish olive ventrad than elsewhere; cephalic and median coxae and trochanters with a usually definite wash of pale carmine. General color of female as a whole uniform in the individual but variable in tone, ranging from cinnamon-buff, through buckthorn brown, russet, and even buffy olive to blackish fuscous. The pattern found in the male sex is intimated only faintly and in few individuals by broken remnants of medio-

longitudinal and lateral dark bars. There is frequently present a pale fuscous wash which tints all the depressions, leaving the high points of the general color, while the caudal femora are occasionally obscurely cross-barred, the tibiae and cephalic and median limbs always largely infuscate. In one female of very light base color the limbs are relatively heavily infuscate. One marked color type, probably genetic, has a distinct infuscate fastigial and occipital median bar, which also covers much of the same area on the pronotum, weakest at the transverse center, but the continuation upon the other nota and abdominal tergites as vestiges of a medio-longitudinal bar is sometimes but not always correlated. An infuscation of the venter of the fastigium, the vicinity of the antennal bases and the whole ventral half of the frontal costa, and sometimes of other parts of the face and the genae, is, however, correlated with the infuscation of the occiput. Eyes range from ochraceous-tawny to blackish fuscous. Ventral surface generally paler than dorsum and never darker than dull russet or saccardo's umber.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Rosario, *type*	15.9	2.68	11.6
♂, Rosario, average of six *paratypes*	16.7	2.53	11.5
	(15.3–17.9)	(2.35–2.68)	(10.5–12.2)
♀, Rosario, *allotype*	27.6	3.44	12.9
♀, Rosario, average of six *paratypes*	25.5	3.52	13.1
	(20.5–28.2)	(3.19–3.78)	(12.3–13.8)

Paratypic Series.—In addition to the type and allotype we have before us eighteen males and twenty-eight females, taken at the type locality (Rosario) between July 11 and 26, 1930. All of these we are considering paratypes.

Morphological Notes.—The measurements given above will make evident the very considerable amount of size variation to be found in both sexes of this species. The frontal costa shows in both sexes a marked amount of variation in the degree of expansion of the dorsal flask-shaped section. The degree of emphasis of the oblique carinations of the lateral lobes of the pronotum varies

quite appreciably in different individuals of the female sex particularly. The median production of the ultimate sternite (subgenital plate) of the male shows an appreciable amount of variation in width, particularly of the more proximal section, as well as the exact trend of the lateral margins of the same. These may be converging distad or even subparallel for a short distance mesad. Similarly the paired spines distad on the same process vary in their relative length and in the exact angle of their divergence, while the more proximal (marginal) pair of spines also vary in their emphasis and somewhat in their exact position.

Biological Notes.—This striking species is partial to the subtropical cloud-forest zone on the San Juancito Mountains. It prefers the drier sections near the borders of the forest belt and was absent from the more moist and the denser interior of this very distinctive area. It was in particular locally numerous along a trail near the Peña Blanca mine level, at 5900 feet elevation, and here it was collected July 14, 22, 23 and 26. Adults were taken but twice below 5900 feet elevation—two males found July 18 in a ravine below cloud forest at 4900 feet, where the cover was virtually continuous with the forest above, which once had reached down to that point; and two females taken July 25 at 4800–5000 feet along a trail through culled cloud-forest and second growth brush.

The preferred immediate habitat of adults of *oresterus* was on the ground in or near dead leaves, but occasionally it occurred in areas of short grass and other low cover, but always on the ground. Rarely it was noticed on bare rock outcrops. Both sexes are good jumpers, but the female appeared more active and harder to capture, although distinctly more numerous than the males. Probably the markedly protective coloration of the females enabled them to escape observation more readily than the conspicuously bicolored males.

The first adults taken were secured on July 11, those captured on the tenth being immature individuals. The latter condition was also taken outside of the forest, while sweeping bush cover along a flume across land which a few generations past had carried cloud forest. The last immature individual in the series was taken July 23. None of the immature specimens preserved is

older than the second instar preceding maturity, while a number represent one and even two preceding the antepenultimate one.

Specimens examined: 73; 19 ♂, 29 ♀, 25 immature individuals.

HONDURAS: Rosario (and adjacent Peña Blanca) San Juancito Mountains; elevation, 4800–6000 feet; July 10–25, 1930; (Academy-Emlen-Worth Expedition; J. A. G. Rehn, C. Brooke Worth and J. T. Emlen, Jr.); 19 ♂ (*type* and *paratypes*), 29 ♀ (*allotype* and *paratypes*), 25 immature individuals; [A. N. S. P.].

Group Eumastaces

EUMASTAX Burr[37]

1834. *Mastax* Perty, in Spix and Martius, Delectus Animal. Artic. Brasil., p. 122. (Not of Fischer, 1825.)

1899. *Eumastax* Burr, Anales Soc. Españ. Hist. Nat., XXVIII, pp. 90, 94, 257.

GENOTYPE (by monotypy): *Mastax tenuis* Perty.

Generic features.—(Based on and adopted from Burr, 1899.) Vertex rotundate, passing into frontal costa; latter very narrow between antennal bases. Antennae short, slender, bicolored (two proximal articles of body color, remainder infuscate). Eyes moderately prominent. Pronotum relatively small, rather narrow, with a low median carinula; cephalic margin straight to concave; caudal margin rotundate. Tegmina abbreviate[38] or fully developed, narrow, apex roundly ampliate, hyaline, veins pencilled, venation multifenestrate, not closely reticulate. Wings, when present, large, broad, rounded, hyaline. Abdomen slender, in male apex is subclavate. Limbs long, slender; cephalic tibiae ventrad in distal part spinulose on both margins; caudal tibiae

[37] Burr in 1899 (An. Soc. Españ. Hist. Nat., XXVIII, p. 271) recorded the Ecuadorian *Paramastax magna* Giglio-Tos from "Mexico." If the material so reported really is *magna*, it undoubtedly did not come from Mexico, and if it actually came from Mexico it probably represents an undescribed species of *Eumastax*.

The senior author many years ago (Proc. Acad. Nat. Sci. Phila., 1904, pp. 675–676, (1904)) called attention to the fact that *Paramastax magna* as described by Burr in 1899 differs in maculation from that species as originally described by Giglio-Tos, and suggested Burr's material was not *magna*. A male from the Perené Valley, Peru, then studied, agreed with the original description of the species. We are well acquainted with *Paramastax*, having before us the genotypic and a number of other species, but have seen no material of the genus from north of Colombia. The senior author, on the basis of his Orthoptera field work in Central America, feels confident *Paramastax* does not occur there.

[38] Never truly abbreviate in Central American species. See comments below in re *Scirtomastax*.

with spines of dorso-internal margin of alternate length; caudal metatarsi unarmed and often hirsute dorsad.

Coloration.—The species of the genus *Eumastax* are often exceedingly beautiful in life, possessing a vividly lustrous golden green sheen, which very soon is lost in the dry material. There is, apparently, no way of preserving this exceptional brilliancy, which with their unusual form and incredible activity places them among the most interesting of the Neotropical Acrididae. In consequence the coloration described in the following pages is not that of the living insect, but instead of the dried cabinet specimen, which merely suggests, and but faintly, the gem-like beauty of life.

Certain species of the genus have been described as having the eyes bicolored, and this has been used as a specific feature. Evidently, however, it is merely a condition produced by desiccation, without sexual or geographic correlation, as we find bicolored and unicolored eyes in series of a single species taken by the senior author at the same place and the same time.

Another color feature which shows some variation is the extent to which the reddish area of the caudal femora, particularly in the female sex, is overlaid or infuscate with cloud annuli of fuscous. In certain species like *hondurensis* and *cerciata* this condition is more evident than in others, but it is apparent in all the Central American species except those of the Surda Group, in which it is little indicated. The degree of infuscation of the head and the extent to which the dorsum of the pronotum is involved by similar infuscation is apparently, or at least to a considerable degree, dependent upon the strength of the intensification or recession of the general darker pattern.

Distribution.—In Central America *Eumastax* is limited to the lowland truly Tropical Zone, and is not known from the Subtropical or Temperate Life Zones, in at least the former of which members of the Episacti occur. Its most northern definite record is from the north coast district of Honduras (*hondurensis*), but it doubtless occurs in the lower Motagua Valley of Guatemala, in British Honduras and the rain-forest areas of the Tehuantepec region of Mexico. Southward the genus ranges to at least south-central Bolivia (*E. boliviana* Hebard, from Buena Vista, Chuqui-

saca, Bolivia), eastward to eastern Brazil. No member of the genus occurs in the West Indies proper, although Bruner has reported a nymph of undetermined species from Trinidad.

Classification of Central American Species.—The Central American members of the genus fall naturally into two major sections, one comprising the very distinctive *E. cerciata* Hebard, the other containing the remaining six species. The latter assemblage, however, is composed of four distinct species groups, of which three are represented by a single species each, while the fourth contains three very closely related Panamanian and Costa Rican forms (*surda*, *veraguae* and *dentata*), as well as one from Colombia (*E. carrikeri* Hebard).

The linear arrangement of Central American species which appears most logical and natural is as follows:

Kressi Species Group. *E. kressi* new species (Costa Rica and Panama.)
Surda Species Group. *E. surda* Burr. (Costa Rica and Panama.)
E. veraguae Hebard. (Panama.)
E. dentata Saussure. (Costa Rica.)
Silvicola Species Group. *E. silvicola* new species. (Costa Rica.)
Hondurensis Species Group. *E. hondurensis* new species. (Honduras.)
Cerciata Species Group. *E. cerciata* Hebard. (Panama.)

As mentioned above *E. carrikeri* Hebard, described from Andagoya, Antioquia (Chocó), Colombia,[39] belongs to the Surda Species Group. The type of this species is now before us. Whether the rather sharply cut Surda Species Group occurs south of the territory of *carrikeri* is not known, but it apparently reaches its maximum differentiation in Costa Rica and Panama.

Hebard in 1923 stated[40] that *dentata* is inseparable from *surda*, an assumption quite logical in view of the fact that both were based on the female sex, in which these species are almost indistinguishable. In addition the exceedingly slight differential features of the female had not been pointed out. However, the two as we understand them are distinct and inhabit altitudinally distinct although adjacent areas. Hebard's further statement in the same footnote that but a single species of *Eumastax* is represented in Costa Rica is, and was then, incorrect. Both *silvicola* and *surda* were in the series then examined.

[39] Trans. Amer. Entom. Soc., XLIX, p. 181, pl. xi, figs. 6, 7 and 8, (1923).
[40] Trans. Amer. Entom. Soc., XLIX, p. 178 footnote, (1923).

The following key is a purely artificial one, based chiefly on the male sex, as differential characters for the females in most species are very slight and then not wholly reliable. The key to the males, however, will serve to distinguish the species by characters which can readily be observed. That given for the female sex is intended merely as an auxiliary, and the authors suggest that the appropriate figures here given be consulted in all cases.

No attempt has been made to use coloration as a distinguishing feature, as the living coloration has not been preserved and what remains shows little which could be used in a diagnostic sense.

Key to Central American Species of Eumastax

Males

1. Cerci styliform, tapering, rarely weakly clavate at apex, not angularly bent in vertical plane (i. e. as seen in lateral aspect), varying in length.....2

   Cerci elongate, heavy proximad, mesad bent obtuse-angulate ventrad in vertical plane (i. e. as seen in lateral aspect) and with the distal portion straight acute produced, subcompressed dorsad, in dorsal aspect moderately incurved in distal half. (Panama.).....*cerciata* Hebard

2. Ultimate sternite (subgenital plate) in profile with dorso-lateral margins straight or as a whole evenly and but moderately arcuate.....3

   Ultimate sternite (subgenital plate) in profile with dorso-lateral margins strongly elevated, sinuato-arcuate proximad, straight distad to apex. (Size large.) (Eastern Costa Rica.).....*silvicola* new species

3. Cerci short, stocky, apex slightly but appreciably thickened and subclavate. Cephalic and median limbs proportionately more slender and elongate. (North coast of Honduras.).....*hondurensis* new species

   Cerci tapering, styliform, sometimes blunt but not subclavate at apex. Cephalic and median limbs proportionately less slender and elongate.....4

4. Size larger (average body length of male, 14.9 mm.; average length of caudal femur of male, 11.6). Ultimate tergite (supra-anal plate) not sharply cut off from preceding tergite by a decided transverse surface flexure. Dorso-lateral margins of ultimate sternite (subgenital plate) straight in profile, apex of sternite distinctly subrostrate produced distad. (Southeastern Costa Rica and adjacent Panama.).....*kressi* new species

   Size smaller (average body length of male 12.6 mm.; average length of caudal femur of male, 10). Ultimate tergite (supra-anal plate) distinctly cut off from preceding tergite by a transverse surface flexure, usually very evident in profile.[41] Dorso-lateral margins of ultimate sternite (subgenital plate) faintly to appreciably arcuate in profile, apex not at all or but weakly (*surda*) subrostrate produced distad.....5

[41] This feature must be used with caution. Compression or other stress will exaggerate or nullify the normal condition, which is that here characterized. (See page 66 footnote 49.)

5. Caudo-lateral angles of tenth tergite, ventrad of cercal bases, but faintly acute. Dorso-lateral margins of ultimate sternite (subgenital plate) appreciably arcuate in profile, apex of same sternite in profile blunt, arcuate, not acute, in disto-dorsal aspect the apex is seen to be distinctly but narrowly and briefly fissate. (Western Costa Rica.).....*dentata* Saussure

Caudo-lateral angles of tenth tergite, ventrad of cercal bases, distinctly produced, markedly acute. Dorso-lateral margins of ultimate sternite (subgenital plate) hardly or but weakly arcuate in profile, apex of same in profile briefly acute, in disto-dorsal aspect the apex is not at all fissate.....6

6. Cephalic and median limbs more elongate and more slender. Cerci more elongate and slender distad, slightly longer than the penultimate sternite. Dorso-lateral margins of ultimate sternite (subgenital plate) subsinuate, not weakly arcuate as a whole. (Chiriqui, Panama and western Costa Rica.)...
.....*surda* Burr

Cephalic and median limbs shorter and more robust. Cerci less elongate and heavier distad, no longer than the penultimate sternite. Dorso-lateral margins of ultimate sternite (subgenital plate) weakly arcuate as a whole. (Rio Chagres and Porto Bello, Panama.).....*veraguae* Hebard

Females

1. Ultimate sternite (subgenital plate) with distal margin as a whole transverse arcuate.....*cerciata* Hebard

Ultimate sternite (subgenital plate) with distal margin produced rectangulate to acute-angulate, at least a median angulation being conspicuously developed.....2

2. Ultimate sternite with distal margin distinctly denticulate, the margin as a whole rectangulate with a faintly acute apex.....*hondurensis* new species

Ultimate sternite with distal margin smooth to micro-crenulate or micro-denticulate, but not distinctly denticulate as in alternative, median production of the margin averaging more pronounced.....3

3. Immediate angle of distal margin of ultimate sternite distinctly but not strongly lanceolate acute produced distad of general angulation of lateral portions of margin.....*kressi* new species

Immediate angle of distal margin of ultimate sternite less produced distad of general angulation of lateral portions of margin.....4

4. Distal margin of ultimate sternite with lateral portions arcuate convergent, the immediate angle brief and blunt arcuate; ventral surface of sternite with two boss-like areas separated by a very evident medio-longitudinal impression...
.....*silvicola* new species

Distal margin of ultimate sternite with lateral portions regularly convergent, the immediate angle very sharply acute, spicate; ventral surface of sternite without structure given in alternative.....5

5. Distal margin of ultimate sternite without evident crenulations or denticulations, lateral portions of margin regularly and straight convergent to apex.....
.....*veraguae* Hebard

Distal margin of ultimate sternite with micro-crenulations, lateral portions of margin somewhat concave before immediate apex.....6

6. Micro-crenulations of distal margin of ultimate sternite coarser and less denticulate.....*dentata* Saussure

Micro-crenulations of distal margin of ultimate sternite finer, sharper and more denticulate.....*surda* Burr

Eumastax kressi[42] new species (Plate V, figs. 55–57; pl. VI, fig. 58.)

The chief differential characters of *kressi* have been summarized in the key to the species of the genus. Diagnostic comparisons of the other species with *kressi* are given under the respective specific treatments.

Type.—♂; Along Duroy River, north end of Suretka Trail, Estrella Valley, Costa Rica. September 9, 1927. (J. A. G. Rehn; on foliage of forest undergrowth.) [Academy of Natural Sciences of Philadelphia, Type no. 5526.]

Size relatively large (for Central American species); form as usual in genus, fully alate.

Head with the ascending occiput regularly and moderately convex; least fastigiofacial interspace between eyes narrow, hardly greater than that between internal sides of the bases of the proximal antennal articles; frontal costa narrow, the margins in contact at the paired ocelli, faintly widening ventrad of median ocellus, sulcation there well indicated: accessory facial carinae subparallel: eyes short-ovate in lateral view, depth of eye in profile equal to one and one-half times depth of gena along accessory carina: antennae equal in length to seventeen-twentieths of depth of head, composed of fourteen articles.

Pronotum with general sellate form modified by the appreciable deplanation of the dorsum, greatest caudal width of disk equal to three-fifths of greatest pronotal length: cephalic margin of disk subtruncate; caudal margin of same obtusely arcuate; median carinula more distinctly indicated on the rugulose metazona, which is not more than half as long as the much smoother prozona of the disk, the prozona with its surface broken only by the cephalic transverse sulcus, which is impressed, and cephalad of which the surface ascends somewhat to the cephalic margin; lateral carinae of disk indicated caudad on prozona and on metazona, subarcuate on prozona, broken by principal sulcus and not pronounced in emphasis: lateral lobes of pronotum appreciably longer than greatest caudal depth, the latter but three-fourths of the dorsal length of the lobe; cephalic margin and ventrocephalic angle broadly arcuate; ventral margin subsinuate moderately cephalad

[42] Named for Mr. Samuel Kress, Agricultural Superintendent of the United Fruit Company in Costa Rica, as a slight recognition of his many courtesies and cordial hospitality.

of middle, subarcuate caudad; ventro-caudal angle narrowly rounded rectangulate; caudal margin nearly straight, subvertical; cephalic transverse sulcus disappearing on dorsal section of lobes, median sulcus reaching continuously to ventral margin of lobes, principal sulcus distinct but less extensive ventrad; surface of metazona of lateral lobes largely subrugulose, of prozona subglabrous.

Tegmina and wings slightly surpassing apex of abdomen.

Tenth abdominal tergite with ventro-caudal angles (ventrad of cercal bases) rectangulate, but moderately produced: ultimate tergite (supra-anal plate) in general form acute produced, apex subuncinate in profile, surface proximad with paired lateral intercercal impressions and a median transverse impression, which forms the base of the tergite's surface yet does not definitely cut it off from that of the more proximal ring-like tenth tergite: cerci styliform, tapering, blunt at apex, non-clavate, reaching about as far caudad as the apex of the ultimate tergite, in dorsal view weakly incurved in distal half: ultimate sternite (subgenital plate) subfornicate, at apex subrostrate produced, ventro-distal surface with a brief carinulate median ridge reaching the apex, which in dorsal aspect, with the adjacent converging distal two-fifths of the dorso-lateral margins, is rectangulate; the latter margins in profile virtually straight.

Limbs of medium length for genus; caudal femora surpassing apex of abdomen by less than twice length of pronotal disk.

Allotype.— ♀ ; Same data as type but taken September 8, 1927. [Academy of Natural Sciences of Philadelphia.]

Differing from the description of the male sex (type) in the following noteworthy sexual features.

Head with least fastigio-facial interspace between eyes slightly wider than width between internal sides of the bases of the proximal antennal articles: eyes less exserted than in male, in lateral aspect with depth but slightly greater than depth of gena along accessory carina: antennae equal to about three-fifths depth of head.

Pronotum with caudal margin of disk broadly arcuate, less obtuse-arcuate, disk slightly broader; cephalic transverse sulcus less markedly indicated.

Tegmina and wings falling short of apices of ovipositor jaws, hardly surpassing bases of same.[43]

Tenth abdominal tergite apparently coalesced with ultimate tergite (supra-anal plate), no definite limiting sulcus being evident, the ultimate tergite, dove-tailing proximad into the former, bears on the proximal half of its surface mesad a sharply outlined, deplanate,[44] scutellate, distally narrowing area, with a distinct medio-longitudinal sulcus, the bounding lateral and distal carinae decided; distal half of ultimate tergite acute lanceolate and supplied medio-longitudinally with a carinu-

[43] Other specimens with retracted abdomens show tegmina reaching to ovipositor apices.

[44] Often this area is distinctly concave, apparently due to the degree of contraction which has taken place in drying.

lation which forks proximad and is thus continuous with the lateral bounding carinae of the more proximal scutellate area; in profile the apex of the ultimate tergite is moderately decurved: infra-cercal plates elongate, lanceolate, subacute at apex, external surface of same canaliculate-excavate: cerci slender, styliform, markedly tapering, reaching nearly to apex of process of ultimate tergite, slightly arcuate dorsad as seen in profile: ovipositor jaws moderately elongate, somewhat compressed, normally armed margins will supplied with teeth, those distad nearly trigonal in outline: ultimate tergite (subgenital plate) with its distal margin as a whole acute, the very sharp apex slightly more lanceolate acute than the general marginal angle, the distal two-fifths of the angulate margin micro-denticulate, ventral surface of sternite with a brief and fine sulcation.

Caudal femora surpassing apices of ovipositor jaws by approximately the length of the pronotal dorsum.

Coloration.—Pronotum, pleura, proximal section of abdomen, sterna, cephalic and median limbs and much of proximal half of caudal femora of male dull aniline yellow to pyrite yellow, with a metallic sheen in life; in female the same areas are nearer old gold (Ridgway) in tone; clypeus, labrum and less decidedly the mandibles javel green to peacock green and parrot green, occasionally the clypeus is not involved and the two proximal antennal articles are wholly or in part of the same shade; face naples yellow to pale dull green-yellow in the male, nearly as dull as old gold in the female, its sulcal and lateral carinulae occasionally washed with orange-chrome to flame scarlet; genae and occiput suffused to a variable degree with fuscous brown, always more intense on the occiput and more dilute on the genae, the occiput sometimes solidly colored but usually showing pale greenish areolae and a median line; antennae distad of two proximal articles fuscous black; eyes uniform chestnut-brown to mummy brown, or bicolored, dorsad fuscous brown, ventrad tawny-olive to snuff brown; tegmina and wings washed with pale fuscous, discoidal and anal veins of tegmina weakly pencilled with whitish. Abdomen passing distad to old green to orange-citrine in the female, to olivaceous fuscous in the male, in the latter sex occasionally with indications of longitudinal darker lateral bars briefly dorsad of the ventral margins of the tergites; cerci and much of ultimate tergite (supra-anal plate) fuscous black; ovipositor jaws lettuce green to spinach green, teeth and more rugose portions of dorsal and ventral surfaces fuscous; other abdominal tergites occasionally show darkening in the forms of transverse bands at their apices.

Cephalic and median tibiae distad and tarsi becoming clear grass green to parrot green, the dorsal carinae of the tibiae pencilled with fuscous black, the ventral spines of the same color; caudal femora with the blackish pencilling of the carinae in the proximal half pronounced, genicular area olivaceous green, very largely overlaid with black, the area between apex and proximal half solidly scarlet to brazil red; caudal tibiae oil green immediately distad (with tarsi), remainder olivaceous-fuscous with a weak but distinct preproximal paler annulus, spines blackish tipped.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, North end of Suretka Trail, *type*	15.5	2.1	10.8	11.5
♂, Same locality, average of six, *type* and *paratypes*	14.9	2.21	11	11.6
	(14.1–15.6)	(2.05–2.35)	(10.7–11.4)	(11.3–11.9)
♂, Saturno Farm, *paratype*	14.5	2.1	10.5	11.1
♂, Changuinola District	14	2.1	10.9	11.2
♀, North end of Suretka Trail, *allotype*	21.4	2.68	12.8	15.2
♀, Same locality, average of four, *allotype* and *paratype*	21.6	2.52	12.7	15.3
	(21.4–21.8)	(2.27–2.77)	(12.2–13.1)	(15.2–15.8)

Paratypic Series.—We have indicated as paratypes six males and three females bearing the same data as the type and allotype; three males from the Suretka Trail, Costa Rica, taken May 19, 1924 by Dr. J. Chester Bradley and in the collection of Cornell University; two males from Vesta Farm, Estrella Valley, Costa Rica, taken September 11 and 13, 1923 by J. A. G. Rehn; one male, two females from Saturno Farm, Estrella Valley, Costa Rica, taken September 12, 1923 by J. A. G. Rehn; and one male taken in the Estrella Valley, Costa Rica, April 22, 1916, by C. H. Lankester. Unless otherwise specified these paratypes are the property of the Academy of Natural Sciences of Philadelphia.

Distribution.—The species *kressi* is seen from the available material to occupy the Estrella Valley region of south-eastern Costa Rica and the Changuinola River section of the adjacent

Bocas del Toro district of Panama. The Suretka Trail crosses the forest mountain ridge which separates the Estrella and Sixaola Valleys, and apparently the distribution of *kressi* is continuous in this entire area, where forest conditions have not been destroyed. We have no information as to how high the species ascends,[45] or how far it ranges to the eastward across northern Panama. Apparently, however, it is a species of relatively limited distribution.

Biological Notes.—The environment preferred by *kressi* is the foliage of ground cover in heavy lowland rain-forest, where, like many of its relatives, it prefers the patches of sunlight which filter through the heavy leaf canopy overhead and spangle the forest shade with pockets of brilliancy. These "sunlight holes" prove gathering points for many of the forest acridids, which elsewhere are less in evidence. The present species has all the nimbleness of its relations in eluding capture, and sweeping was the surest method of collecting them. As soon as the sunlight failed, or the frequent rainy season showers descended, it was not to be seen. It was rarely taken by systematic beating, which is often so productive, although less so in tropical rain-forest than elsewhere.

The immature individuals from Vesta Farm, taken over a three day period, represent the two instars immediately preceding the imagal condition. The data now in hand show the species occurs adult in the same region from at least as early in the year as mid-April to as late as mid-September.

Specimens examined: 42; 15 ♂, 6 ♀, 7 immature ♂, 14 immature ♀.

COSTA RICA: Suretka Trail, between Estrella and Sixaola Valleys; May 19, 1924; (J. C. Bradley); 3 ♂ (*paratypes*), 1 immature ♀; [Cornell University]. Along Duroy River, north end of Suretka Trail; September 8 and 9, 1927; (J. A. G. Rehn;

[45] We have before us, in addition to the specimens listed, a single typical male of *kressi*, labelled as taken at Ujarrás de Térraba, Costa Rica, September 10, 1907, by M. A. Carriker, Jr., from the Hebard Collection. This locality is at an elevation of 7000–8000 feet in the Cordillera de Talamanca, at an altitude and in an environment where *Eumastax* does not occur in Central America. We are convinced some error has taken place in the labelling of this and other material so credited. Other species of Orthoptera in the same lot and said to be from Ujarrás de Térraba (see Carriker, Am. Carneg. Mus., VI. p. 356–357, (1910), for notes on this locality), we are equally convinced never came from there, as all are lowland Talamancan rain forest species and by no means cloud-forest forms, as would be found at 7000–8000 feet. For that reason we do not doubt that material taken by Mr. Carriker during a year's residence in the Sixaola Valley has been erroneously labelled as from Ujarrás de Térraba.

in dense forest); 7 ♂, 4 ♀ (*type*, *allotype* and *paratypes*), 5 immature ♀; [A. N. S. P.]. Estrella Valley; April 22, 1916; (C. H. Lankester); 1 ♂ (*paratype*), 1 immature ♀; [A. N. S. P.]. Saturno Farm, Estrella Valley, 100 feet elev.; September 12, 1923; (J. A. G. Rehn; foliage on margin of wet forest); 1 ♂, 2 ♀ (*paratypes*); [A. N. S. P.]. Vesta Farm, Estrella Valley, 200 feet elev.; September 11 and 13, 1923; (J. A. G. Rehn; in dense forest, adults very scarce, immatures numerous); 2 ♂ (*paratypes*), 7 immature ♂, 7 immature ♀; [A. N. S. P.].

PANAMA: Changuinola District, Bocas del Toro; May 15, 1924; (J. C. Bradley); 1 ♂; [Cornell University].

Eumastax surda Burr (Plate VI, figs. 59–62.)

1899. *Eumastax surda* Burr, Anales Soc. Españ. Hist. Nat., XXVIII, pp. 258, 264. [♀; Chiriqui, Panama.][46]

1901. *Eumastax surda* Bruner, Biol. Cent.-Amer., Orth., II, p. 23, pl. ii, figs. 14, 14a. [♀; Chiriqui [Panama]; Bugaba [Chiriqui, Panama]; Peru (in error).]

The present species, the two here following it (*veraguae* and *dentata*) and *carrikeri* Hebard, from the Colombian Chocó,[47] constitute a well marked group of very closely related forms, inhabiting different areas, each apparently of limited extent. As far as known *surda* has the widest range of the four, being found at relatively low elevations in the Chiriqui district of western Panama and over parts of southwest and western Costa Rica. In the latter country it probably extends little, if at all, north of the Gulf of Nicoya region.

The species of the Surda Group are rather small and agree in their general similarity of size and proportions, but differ in less obvious features of the external genitalia of the males. The features separating these species have already been stressed in the key (see page 58) and need not be repeated in their entirety.

The present species and *veraguae* are more nearly related to one another than they are to *E. dentata*, which differs mainly in the less decided production of the caudo-lateral angle of the tenth abdominal tergite of the male, and in the briefly fissate apex of the ultimate sternite (subgenital plate) of the same. Our knowledge of the female sex of the four species of the Surda Group is by no means full enough to warrant comparative discussion of their

[46] This is given as "Chiriqui, Perou," an evident transcriptional or typographical error for the well-known district of Chiriqui, Panama.

[47] Trans. Amer. Entom. Soc., XLIX, p. 181, pl. xi. figs. 6, 7 and 8, (1923). [♂, ♀; Andagoya, Antioquia (Chocó), Colombia.]

differential features, which latter are at best but slight. The determination of females of the genus *Eumastax* without accompanying males is exceedingly difficult, unsatisfactory and hazardous, and will remain so until sufficiently long series of perfectly preserved specimens are available to weigh properly the constancy of almost infinitesimal differences, which are found in the few available females accompanied by males collected at the same time.

The species *surda* was based on a single female, originally in the Brunner Collection and now the property of the Vienna Museum. The original description is not sufficiently exact to fix the name beyond possibility of question on any particular species, naturally lacking the distinctive features found in the male sex. In consequence the placing of *surda* is largely a geographic proposition. We are therefore using the name for the species which more nearly tallies with the description, and which we have from a region near to and environmentally more like the lower levels of Chiriqui Province, Panama, than is true of the other members of the group known to us. This seems the only logical course to follow with a species of which the unique female type specimen can give little or no definite assistance in the recognition of the species. So the species may be recognized with little difficulty, the following description of its more salient features should be of assistance.

♂; Pozo Azul de Pirrís, near junction of the Rio Grande de Pirrís and the Rio Parrita,[48] western Costa Rica. Elevation 325 to 550 feet. August 21, 1927. (C. H. Lankester and J. A. G. Rehn.) [Acad. Nat. Sci. of Phila.]

Size rather small (for genus); form as typical in genus, fully alate.

Head structure and proportions as in *E. kressi* except that the fastigio-facial interspace between the eyes is slightly broader, the lateral margins of the frontal costa ventrad of the median ocellus are less distinctly carinate, and the accessory facial carinae are less emphasized.

[48] This locality is on the extreme northern border of the plain of the Pirrís, immediately on the Rio Parrita but a very short distance above its junction with the Rio Grande de Pirrís. It is an abandoned small cattle ranch building in fairly heavy forest country, with cane areas along the Rio Parrita. Immediately to the north the hill slope rises to the low, forest-covered mountain ridge which intervenes between the Rio Parrita and the Rio Colorado, a parallel tributary of the Pirrís. The elevations collected on the south slope of the hills are covered by the extremes given above.

Pronotum slightly narrower on the dorsum than in *E. kressi*, cephalic transverse sulcus on the dorsum less definitely marked.

Tegmina and wings of same proportions as in *E. kressi*, but marginal field of tegmina proportionately narrow, with mediastine vein occupying middle of field for a greater portion of its length.

Tenth abdominal tergite with ventro-caudal angles (ventrad of cercal bases) acute, distinctly sharper than a rectangle; ultimate tergite (supra-anal plate) elongate lanceolate, distinctly acute produced, apex non-uncinate in profile; surface of tergite cut off from that of tenth tergite by a transverse arcuate impression,[49] which is usually quite evident in profile: cerci styliform, tapering, elongate, reaching as far distad as apex of ultimate tergite (supra-anal plate), apex blunt acute, more attenuate than in *E. kressi*, in lateral aspect nearly straight, in dorsal aspect slightly inbowed at apex: ultimate sternite (subgenital plate) less produced than in *E. kressi*, apex not distinctly rostrate, weakly produced, in profile blunt acute, seen from dorsum with dorsal margins weakly convex, acute convergent distad, in lateral aspect dorsal margins are shallowly convex in proximal two-thirds, thence to apex straight; disto-ventral surface of ultimate sternite briefly and finely carinulate.

Cephalic and median limbs slightly more slender than in *E. kressi*. Caudal femora with apices surpassing apex of abdomen by faintly more than twice the pronotal length.

A female, bearing the same data as the male described above, except that it was taken August 19, 1927, shows the following noteworthy differences from the female of *E. kressi*.

Size somewhat smaller.

Head with the fastigio-facial interspace between the eyes proportionately broader, as in the male; frontal and accessory facial carinae as in the male.

Pronotum with dorsum slightly narrower, as in the male sex.

Tegmina with marginal field narrower proportionately and the mediastine vein in relatively the same position as in the male sex.

Ultimate tergite acute lanceolate, narrower than in the female of *E. kressi*, the apex more sharply acute, the dorsal surface briefly distad of middle subcompressed laterad, medio-longitudinal carina of distal half similar to but less definite than that of *E. kressi*, the proximal forking sharper and broader than in the latter: ovipositor jaws in ventral aspect faintly stockier and less elongate than in *E. kressi*,

[49] The degree of emphasis of this varies according to the compression or other stress to which the apex of the abdomen of the dried specimen had been subjected. It is sometimes little evident, again strongly marked, and the two conditions taken by themselves might be considered to represent quite different species. Similarly compression of the tenth and ultimate sternites produces a marked longitudinal sulcation of rectangulate cross-section, giving an entirely different appearance to the whole area from that seen in less distorted specimens. Due to the relative softness of the integument the characters of this area must be carefully appraised and not over-emphasized.

surface dentations less robust and strongly elevated: ultimate sternite (subgenital plate) with distal margin acute-angulate, immediate apex sharply acute produced, spicate, micro-crenulations of distal half of angulate margins evident.

Coloration.—Almost identical with that of *E. kressi* with a few noteworthy exceptions. The discoidal and anal veins of the tegmina are not distinctly pencilled with whitish; caudal tibiae almost completely lacking the pale preproximal annulus found in *E. kressi.*

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Pozo Azul, described specimen	12.9	2.1	9.2	10.1
♂, Same locality, average of six	12.4	2.18	9	10
	(11.7–13)	(2.1–2.26)	(8.9–9.9)	(9.9–10.5)
♂, Surubres	11.9	2	8.1	—
♀, Chiriqui, *type* (ex Burr)	18	3[50]	10	13
♀, Pozo Azul, described specimen	16	2.35	10.9	13.7
♀, Pozo Azul, average of eleven	17.8	2.39	11.2	13.2
	(15.5–18.9)	(2.27–2.43)	(10.5–12.1)	(12.5–13.8)
♀, Surubres, average of two	17.6	2.39	10.2	12.5
		(2.35–2.43)	(10–10.3)	(12–13)

Distribution.—Apparently the species *surda* occupies at least the lower levels of the Department of Chiriqui, Panama, probably only on the Pacific side to the southward of the Volcan de Chiriqui. Its distribution is probably continuous northwestward over the lower country of the Pacific side of Costa Rica wherever suitable conditions are present. It very probably is absent from the savanna type country of the lower Rio Diquis and the same is true of the semi-arid, typically Guanacaste condition found at the head of the Gulf of Nicoya and along the Rio Tempisque. The highest elevation from which we have seen it is two hundred and fifty meters on the Rio Surubres, which is a tributary of the Rio Jesús Maria, western Costa Rica. At higher levels, at least in that region, it seems to be replaced by *E. dentata.* Nothing is

[50] It is evident that this was taken hastily, and that it is too large for a member of this genus of the body bulk shown by the other measurements.

known regarding the eastern limit of its distribution toward that of *E. veraguae*. The senior author did not see it at Oricuajo on the lower Rio Jesús Maria, in park-like Guanacaste environment, although many species which had been secured at Surubres were there taken.

Biological Notes.—The species *surda* has habits similar to the other Central American species of the genus, occurring, however, in a relatively drier forest than that inhabited by *E. kressi* or *sylvicola*. That frequented at Pozo Azul was also more open with more light penetration than the sombre depths preferred by *kressi*. The actions of individuals were quite similar to those described for the latter species. The Pozo Azul immatures represent the two instars preceding maturity.

Specimens examined: 26; 7 ♂, 13 ♀; 3 immature ♂, 3 immature ♀.

Costa Rica: Pozo Azul de Pirrís; (M. A. Carriker, Jr.); 2 ♀; [Hebard Cln.]: May 10 to 20; (M. A. Carriker, Jr.); 1 ♀; [Hebard Cln.]; 325 to 550 feet elevation; August 19 to 24, 1927 (C. H. Lankester and J. A. G. Rehn; on foliage of undergrowth in forest and along clearing edge of same); 6 ♂, 8 ♀, 2 immature ♂, 3 immature ♀; [A. N. S. P.]. Surubres, near San Mateo, Rio Surubres, Pacific side, 250 meters elevation; January, 1906 and March, 1907; (P. Biolley); 1 ♂, 1 ♀, 1 immature ♂; [A. N. S. P.]. Bonnefil Farm, Rio Surubres, 700 feet elevation; October 17, 1909, (P. P. Calvert); 1 ♀; [A. N. S. P.].

Eumastax veraguae Hebard

1923. *Eumastax cerciata* Hebard, Trans. Amer. Entom. Soc., xlix, p. 178. (In part only.) [1 ♀; Porto Bello, Panama.]

1924. *Eumastax surdus* Hebard, Trans. Amer. Entom. Soc., l, p. 92. (Not *E. surda* Burr.) [♂; Guamina, Rio Chagres, Panama.]

1933. *Eumastax veraguae* Hebard, Trans. Amer. Entom. Soc., lix, p. 127, pl. vi, figs. 9 and 10. [Based on the above recorded Guamina specimen.]

Our colleague Mr. Hebard has recently described this species, which some years ago he recorded as *E. surdus* (sic pro *surda*). Unfortunately *veraguae* is known in the male sex only from the type, the genitalic features of which have been described and figured by Hebard, and an additional male which has the apex of the abdomen somewhat crushed. In addition to the genitalic features mentioned by Hebard,[51] we would call attention to those here given in the key to the species of the genus. In view of our

[51] Hebard used the term "ninth tergite" for that referred to in this paper as the tenth tergite.

present broader knowledge of the Central American species of *Eumastax*, the emphasis placed on the constriction of the ultimate tergite (supra-anal plate) of the male in the original description of *veraguae* must be somewhat discounted. But slight compression or other pressure gives to this area an exaggerated contour, often completely different from that of other material taken in the same hour's collecting. In the present study we have endeavored to be guided by material with abdominal appendages showing no evidence of pressure.

Among specimens originally considered paratypes of *E. cerciata* Hebard from Porto Bello, Panama, we find one female which was included in that series inadvertently, as it has the ultimate sternite (subgenital plate) radically different in shape from that of *cerciata*, lacking the distal arcuate-truncate outline so characteristic of the female of *cerciata*, and having the distinctly produced type of the same margin found in the Surda and Kressi Groups. From the latter, however, this individual can be separated by its smaller size and the exact shape of the distal margin of the ultimate sternite. It is also separable from the females here referred to those Central American members of the Surda Group other than *E. veraguae*, with the type of which it agrees in all ambisexual features. In consequence we feel it represents the female sex of *veraguae*, and are so recording it, although it lacks the conclusive evidence of accompanying males.

Allotype.— ♀ ; Porto Bello, Panama. April 18, 1912. (August Busck.) [Hebard Collection.]

When compared with the female sex of *E. surda* as understood by us, the present specimen differs in the following noteworthy respects.

Tegmina and wings actually and proportionately longer, reaching caudad nearly to the base of the genicular arches of the caudal femora; tegminal marginal field proportionately broader, the mediastine vein placed close to the costal margin and the area between it and the humeral trunk wider, and with fewer and more regular cross-veins producing elongate rectangular fenestrae. Ultimate sternite (subgenital plate) differing from *surda* merely in the shape of the distal margin being more truly rectangulate, the less briefly spicate acute apex, and the absence of marginal denticulations.

Coloration essentially that of *surda*.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Guamina, *type* (ex Hebard)	13	1.9	10.2	10
♂, Barro Colorado Island	12.5	1.97	10	10.2
♀, Porto Bello, *allotype*	20[52]	2.52	13.5	14

Distribution.—The species is definitely known only from the type and allotype, and a male from Barro Colorado Island, Canal Zone, and its distribution is probably limited to the rain-forest area of the north coast section of Panama. It occurs at Porto Bello with *E. cerciata*, but was not met by the senior author in eastern Costa Rica, where the Surda Group appears to be absent.

Specimens examined: 3; 2 ♂, 1 ♀.

PANAMA: Guamina, Rio Chagres; March 5, 1922; (G. H. H. Tate); 1 ♂ (*type*); [Hebard Cln.]. Porto Bello; April 18, 1912; (August Busch); 1 ♀ (*allotype*); [Hebard Cln.]. Barro Colorado Island, Canal Zone; July 20, 1924; (N. Banks); 1 ♂; [Mus. Comp. Zool.].

Eumastax dentata Saussure (Plate VI, figs. 63–65.)

1903. *Eumastax dentatus* Saussure, Revue Suisse de Zoologie, XI, p. 91. [♀; Palmares, Costa Rica.]

The name *dentata* was based on a single female, and the description consequently lacks mention of any sharply distinctive feature to separate the species from *surda*, the sole previously known near relative, which unfortunately was not mentioned or compared by Saussure. As the type is a female its physical examination would give little help in the proper interpretation of the species, and lacking topotypic males we are compelled to fall back upon hypothesis in placing the name.

Palmares, Costa Rica, the type locality of *dentata*, is situated near the head of the broad upper valley of the Rio Grande de Tárcoles, not far from the larger settlement of San Ramón. It is at an elevation of about three thousand feet above the sea, distinctly higher than any locality from which *surda* is known. We have before us a single male taken by the senior author on the south slope of the western end of the forested Cerros de Bustamente, between the Rio Colorado, at the south foot of the slope,

[52] Allowance made for abnormally curved abdomen.

and Sabanillas de Pirrís, at the trail crossing on the summit of the range. The specimen was picked up along the trail in continuously heavy forest, while travelling with a pack train. The exact elevation was not noted, as the train was moving over a very bad trail, often in deep mud and heavy rain. The altitude, however, was somewhere between 1500 and 3940 feet, and probably much nearer the latter than the former figure, as a badly exhausted pack animal made frequent halts necessary as Sabanillas was approached. We are concluding, therefore, that the species then secured is one of higher levels than *surda*, which had been taken at Pozo Azul on the same trip, and that the present specimen is probably identical with the insect found at approximately the same elevation at Palmares, even though the localities are separated by the relative deep valleys of the Rios Candelaria and Grande de Tárcoles, with the Candelaria mountains between. Until topotypic or virtually topotypic males show the Palmares insect to be different from that for which the name *dentata* is here used, the present course seems warranted and logical.

The more evident features separating *dentata*, as here understood, from *surda* and *veraguae*, have been presented in the key to the species, and it is not necessary to repeat these as a diagnosis.

The male specimen above mentioned shows the following additional differential features deserving mention, as well as details of the genitalic features summarized in the key.

Size and form similar to *E. surda*.

Head with interspace between eyes at vertex faintly broader; frontal costa ventrad of median ocellus faintly broader, margins subparallel.

Tegmina and wings reaching to the apex of the abdomen.

Cephalic and median limbs slightly stockier and more robust than in *E. surda*, but hardly as much so proportionately as in *E. veraguae*, to which greater approximation is made than to *E. surda*.

Tenth abdominal tergite with ventro-caudal angles (ventrad of cercal bases) but faintly acute, little sharper than a right angle: ultimate sternite (supra-anal plate) as in *surda* but with lateral margins distad slightly more acute convergent, sculpture and contour similar: cerci as in *surda* but faintly less robust proximad: ultimate sternite (subgenital plate) in profile with its distal extremity rotundato-subtruncate, not weakly rostrate or subrostrate as in *E. surda* and *veraguae*, not at all acute; dorso-lateral margins from dorsum nearly straight acute convergent, in profile not strongly but distinctly arcuate, in distal aspect the apex is seen to be

narrowly and briefly but distinctly fissate, with a medio-longitudinal carination extending ventro-proximad from the apex over virtually all of the sternite.

Coloration.—There is no colorational feature of important difference from those found in *E. surda, veraguae* and also in *E. kressi.* The anal and discoidal veins of the tegmina are pale, as in *kressi,* no definite preproximal pale annulus is indicated on the caudal tibiae, and the preapical red section of the caudal femora is less extensive than in the average of *surda,* in this respect more like *veraguae.*

Additional Material.—We have before us a single female taken at the Cangrejal de Aserrí, western Costa Rica, which, for purely geographic reasons, we are tentatively referring to *E. dentata.* Its specific reference is purely provisional and it shows no noteworthy difference from the same sex of *surda,* except that the micro-crenulations of the angulate apex of the ultimate sternite (subgenital plate) are finer, sharper and more denticulate than in the related species.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Betw. Rio Colorado and Sabanillas.....	12.8	2.1	9	10
♀, Cangrejal de Aserrí....	19	2.6	11	14

Specimens examined: 2; 1 ♂, 1 ♀.

Costa Rica: Between the Rio Colorado and Sabanillas de Pirrís, south slope of the Cerros de Bustamente, elevation 1500–3940 feet; August 25, 1927; (J. A. G. Rehn; on foliage in heavy forest); 1 ♂; [A. N. S. P.]. Cangrejal de Aserrí, elevation 800 meters; April, 1906; (P. Biolley); 1 ♀, [A. N. S. P.].

Eumastax silvicola new species (Plate VI, figs. 66–69.)

1904. *Eumastax dentatus* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 675. (Not *E. dentatus* Saussure.) [♂, ♀; Carrillo, Costa Rica; Costa Rica.]

The distinctive character of the ultimate sternite (subgenital plate) of the male in this species will distinguish it from the other Central American species. This is well shown in the accompanying figures. In size *silvicola* equals *kressi* and *hondurensis,* and is distinctly larger than the members of the Surda Group, from which it had not been distinguished previously.

Type.— ♂; La Emilia, near Guápiles, Costa Rica.[53] Elevation, 1000 feet. August 20, 1923. (J. A. G. Rehn; on foliage in heavy forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5528.]

The features given below are those of difference from the detailed description of *E. kressi* given on a preceding page (p. 59).

Size as a whole slightly smaller than in *E. kressi;* form similar.

Head as in *kressi* but with the eyes slightly less protuberant in cephalic aspect and in profile faintly less inflated; least fastigio-facial interspace between eyes slightly but appreciably greater than that between internal sides of the bases of the proximal antennal articles; frontal costa slightly narrower than in *kressi;* antennae slightly more slender than in *kressi.*

Pronotum as in *kressi* but with caudal margin of disk more broadly arcuate, the median carinula distinct and continuous, and the cephalic transverse sulcus much less evident on disk; lateral carinae of disk nearly straight and virtually subparallel caudad on prozona and on metazona.

Tegmina and wings in length briefly surpassing the apex of the abdomen; mediastine vein of tegmina placed as in *E. kressi.*

Tenth abdominal tergite with ventro-caudal angles (ventrad of cercal bases) obtuse-angulate, little produced, the ventral margin of same angle well arcuate; ultimate tergite (supra-anal plate) in shape much as in *kressi,* the distal extremity with the angle less sharply acute as seen from the dorsum but equally subuncinate in profile; surface of ultimate tergite sculptured essentially as in *kressi:* cerci slightly shorter than in *kressi,* more distinctly tapering, as seen from dorsum nearly straight and not inbowed, apex more slender: ultimate sternite (subgenital plate) short, strongly fornicate, in no way rostrate, dorsal margins meeting distad at a right angle as seen from the dorsum, the same subparallel in proximal thirds, thence gently arcuate to distal thirds, which are straight convergent to apex; seen in profile the dorsal margins are markedly convex in proximal half, thence straight and gently declivent to apex; in distal view the apex of the sternite is seen to be briefly carinulate.

Limbs as in *E. kressi.*

Allotype.— ♀; Same data as type but taken August 12, 1923. [Academy of Natural Sciences of Philadelphia.]

Differing from the same sex of *E. kressi* in the following noteworthy features.

[53] The immediate environment in which the type of this species, as well as many other Orthoptera, was taken, is that portion of the extensive Santa Clara plains rainforest about one and one-half miles south of the cattle farm of La Emilia, which is on the Northern Railroad about a mile east of Guápiles. The senior author worked in this very rich locality for three weeks in 1923 and 1927.

Size slightly smaller.

Eyes in profile faintly less inflated; frontal costa slightly narrow.

Pronotum showing the same relative features of difference noted in the male sex.

Tegmina and wings slightly shorter proportionately, not surpassing base of ovipositor jaws.[54]

Tenth abdominal tergite and ultimate tergite (supra-anal plate) essentially as in *E. kressi;* cerci slightly heavier at base, more finely tapering, apex more delicate, nearly straight in lateral view; ovipositor jaws in dorsal and ventral views straighter, slightly less divergent meso-proximad: ultimate sternite (subgenital plate) with its distal margin as a whole subrectangulate, with the immediate apex short and blunt acute produced, the distal portion of the lateral sections of this margin more briefly and more shallowly concave before apex, proximad of this the sides of the margin are subarcuate, apical section with margin subcrenulate; ventral surface of sternite with a distinct medio-longitudinal impression separating two low substrumose areas.

Coloration.—As in *E. kressi* in general features and also in the details except as follows: the discoidal and anal veins of the tegmina may or may not be pencilled with whitish (this variation is not governed by sex or locality and is found in both the La Emilia and Juan Viñas series); red area on caudal femora in both sexes slightly less extensive and duller in color, nearer brazil red, with a more definitely indicated tendency toward general subfuscous cloud annuli overlying the red.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, La Emilia, *type*	14.7	2.01	10.2	11
♂, La Emilia, *paratype*	13.9	2.05	10.8	11.9
♂, Carrillo	13	1.97	9.5	11
♂, Juan Viñas	13[55]	1.97	9.8	10.9
♂, Juan Viñas	14.9	1.97	10.2	11.1
♀, La Emilia, *allotype*	20.3	2.35	11.2	13.8
♀, La Emilia, average of four (*allotype* and *paratypes*)	19.9 (19.5–20.5)	2.37 (2.26–2.48)	11.2 (10.8–12)	13.5 (12.5–14)
♀, Parismina	19.1	2.52	12	14.5
♀, 52 miles, near Peralta	21	2.52	11	14.6
♀, Juan Viñas	17.2	2.43	11.5	13.9
♀, Navarro	19.1	2.35	9.1	13.2

[54] In a few specimens in the series studied the tegmina and wings do surpass the base of the ovipositor jaws. In all, however, the abdomen is abnormally retracted.

[55] Abdomen exceptionally recurved.

Paratypic Series.—We have indicated as paratypes those adults before us from the type locality other than the type and allotype, consisting of four males and twelve females, taken on August 12, 15, 16, 18, 20, 22 and 24, 1923 and September 15, 1927.

Distribution.—The present species is one of the rain-forest of the Santa Clara plains of northeastern Costa Rica and the adjacent valley of the Rio Reventazón. How extensive its area of distribution is to the northward we do not know, and also whether its range meets or overlaps that of the Talamancan *kressi* is equally undetermined. We are able to say it reaches tidewater areas on the lower Rio Parismina, and as high as Carrillo on the upper reaches of the Rio Súcio on the lower northern slope of the La Palma Pass between the Volcanos of Irazú and Barba, and up the Reventazón Valley to Navarro, virtually at its head at an elevation of approximately 3950 feet. The species is limited to areas characterized by rain-forest, and does not occur in the Subtropical Zone of higher elevations. At Navarro we find the extreme upper limit of distribution of a number of characteristic Orthoptera species of the Santa Clara and Reventazón tropical element.

Biological Notes.—In habits *silvicola* is essentially similar to *E. kressi* and *surda*, always frequenting the more open sunny spots or "sunlight holes" of its forest habitat, perched on the leaves of vines and other low undergrowth. Its actions are very rapid, in common with most eumastacids, as like the bolt from a cross-bow, to which its hind limbs held akimbo bear a great resemblance, it launches away from a possible disturber. The advent of rain sends all into hiding, and until the sun appears again they will not be seen.

The available data show the species occurs adult from as early as March (day unspecified, Juan Viñas) to as late as November 24 (Chitaría). The series of immature individuals from La Emilia represents three instars over periods as short as three to four days in both the months of August and September (i. e. August 13, 15 and 16, and September 12 and 14). Immature material has not been seen taken later than September 14.

Specimens examined: 50; 12 ♂, 20 ♀, 6 immature ♂, 12 immature ♀.

COSTA RICA: La Emilia, near Guápiles, elevation 1000 feet; August 12–24, 1923; (J. A. G. Rehn; on foliage of undergrowth in open sunny spots of heavy forest);

5 ♂, 12 ♀ (*type, allotype* and *paratypes*), 2 immature ♂, 9 immature ♀; [A. N. S. P.]; September 12–15, 1927; (J. A. G. Rehn; same conditions); 1 ♀ (*paratype*), 2 immature ♂, 1 immature ♀; [A. N. S. P.]. Carrillo; (Underwood); 1 ♂; [Hebard Cln.]. Guácimo, elevation 350 feet; June 7, 1909; (P. P. Calvert); 1 ♀; [A. N. S. P.]. Parismina (lower course of river), elevation one-half meter; July 26, 1928; (M. Valerio); 1 ♀; [A. N. S. P.]. Peralta, August 9, 1909; (P. P. Calvert); 1 ♀; [A. N. S. P.]. Fifty-two mile post on railroad, near Peralta; August 4, 1927; (C. H. Lankester); 1 ♀; [A. N. S. P.]. Chitaría, Province of Cartago, elevation 600 meters; November 24, 1928; (M. Valerio); 1 ♂; [A. N. S. P.]. Pejivalle, elevation 1850–2100 feet; August 11 and 13, 1927; (J. A. G. Rehn; from foliage of forest undergrowth); 1 ♀, 1 immature ♂; [A. N. S. P.]. Juan Viñas; March, 1902; (Bruner); 5 ♂, 1 ♀, 1 immature ♂, 2 immature ♀; [Hebard Cln.]. Navarro, elevation 3800–3950 feet; July 24, 1927; (C. H. Lankester and J. A. G. Rehn; on foliage of broad-leaved plant in forest undergrowth); 1 ♀; [A. N. S. P.].

Eumastax hondurensis new species (Plate II, fig. 4; pl. VI, figs. 70–73.)

The present species differs from all the other known Central American ones of the genus in the short, apically blunt cerci of the male, while the pronouncedly fissate ultimate sternite (subgenital plate) of the same sex is equally distinctive for the species occurring in that geographic area, except for the otherwise quite different and smaller *E. dentata.* The latter species, however, has the shape of the ultimate sternite of the male as a whole very characteristic and not as in *hondurensis.*

The ultimate sternite (subgenital plate) of the female in *hondurensis* is distinctly different from the acute-angulate type found in the species of the genus already treated, approaching instead that occurring in the Panamanian *E. cerciata.* The latter species is, however, widely distinct from *hondurensis* in characters of the male sex.

Type.— ♂; Lancetilla, near Tela, Department of Atlantida, Honduras. Elevation, 700 feet. September 6, 1930. (Academy-Emlen-Worth Expedition; J. A. G. Rehn; from "sunlight hole" in heavy forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5528.]

The following features are solely differences from the characters given for *E. kressi* (see p. 59), to which *hondurensis* exhibits marked general similarity.

Size moderately large (for Central American species).

Head with least fastigio-facial interspace between eyes slightly broader, slightly greater than that between internal sides of the bases of the proximal antennal

articles; dorsal section of frontal costa, between the paired ocelli, with the lateral margins not quite in contact; eyes slightly shorter in proportion to depth of genae, the vertical depth of eye being one and two-fifth times that of genae along accessory carina: antennae equal to depth of head, articles more elongate, distal clavation more extensive longitudinally.

Pronotum with the cephalic margin of disk subtruncate, caudal margin of same broad and low arcuate; median carinula well but not strongly indicated throughout: lateral lobes with ventro-cephalic angle less broadly arcuate than in *E. kressi.*

Tegmina and wings falling slightly short of the apex of the abdomen: marginal field of the tegmina narrower, less fenestrate, with fewer cross nervures, mediastine vein in same relative position as in *kressi.*

Tenth abdominal tergite with ventro-caudal angle rectangulate, not markedly produced: ultimate tergite (supra-anal plate) essentially as in *E. kressi,* but carinulae limiting the lateral intercercal impressions more decided and distinctly joined across median portion of tergite: cerci blunter than in other Central American species, reaching about to apex of ultimate tergite, robust, slightly tapering in proximal half, thence distad slightly thickened and subclavate and with the apex bluntly rounded, not at all attenuate as in the other species, in profile the cerci are faintly upcurved in proximal section, in dorsal aspect faintly incurved distad: ultimate sternite (subgenital plate) fornicate, relatively short, in profile seen to be in no way rostrate produced, dorso-lateral margins in same view moderately convex dorsad, immediate apex distinctly and deeply V-fissate, the fissure in distal aspect reaching ventrad a distance slightly greater than a fourth the depth of the sternite in the same view, ventrad of the fissure a distinct median carinulation extends for a distance about equal to the depth of the fissation.

Limbs distinctly more slender than in *E. kressi,* particularly the cephalic and median pair, the tibiae showing much less compression: caudal femora surpassing apex of abdomen by more than one and one-half times the length of the pronotum, inflation of the proximal section of the caudal femora less marked than in *kressi.*

Allotype.— ♀ ; Same data as type but taken September 4, 1930. [Academy of Natural Sciences of Philadelphia.]

Differing from the female sex of *E. kressi* in the following noteworthy features.

Head with the fastigio-facial interspace between the eyes and the frontal costa showing the same degree of difference noted above in the male sex; eyes in depth but slightly greater than genae along accessory carina.

Pronotum as in male sex.

Tegmina and wings reaching only to base of seventh tergite; marginal field of tegmina narrower than in *kressi,* proportionately as in male sex.

Ultimate tergite (supra-anal plate) in general character as in *E. kressi,* but with the distinct obtuse-angulate carinae bounding the intercercal depressions more decided and uniformly continuous, the distal section of the tergite with the median

carinulation and its proximal forks subobsolete, the marked lateral carinae closely approaching one another at the above-mentioned obtuse-angulation: cerci shorter and stockier than in *kressi*, tapering, the apices falling considerably short of the apex of the ultimate tergite: ovipositor jaws essentially as in *E. kressi:* ultimate sternite (subgenital plate) with distal margin distinctly less produced angulate than in *kressi*, the angle being in general obtuse with the immediate angle briefly more acute, the lateral portions of the same margin finely but distinctly denticulate, ventral surface of ultimate sternite with a distinct transverse, rectangulate preapical impression, from the angle of which a brief sulcation extends to the apex of the sternite.

Limbs showing the same features of difference from the female of *kressi* as mentioned in the description of the male of *hondurensis;* apices of caudal femora surpassing ovipositor apices by somewhat less than the pronotal length.

Coloration.—Of the same general character as in the species already discussed, the distribution, extent and tone of the base colors and pattern being essentially the same except for the following details. Tegmina lacking any white or whitish pencilling of the veins, all fuscous. Caudal femora with reddish of distal portion reaching to middle or proximad of middle, in the female with indications of two clouded infuscate annulations over the red base color, these less evident in some individuals than in others.[56] Caudal tibiae with a pronounced preproximal pale annulus.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Lancetilla, *type*.....	15.1	2.18	9	11.8
♂, Lancetilla, average of three (*type* and *paratypes*).....	15.4 (15–16.2)	2.16 (2.10–2.18)	9 (8.9–9)	11.3 (11–11.8)
♀, Lancetilla, *allotype*.....	20.5	2.52	12	15.8
♀, Lancetilla, average of three *paratypes*.....	20.5 (20–21)	2.52	11 (10–12)	15.4 (14.9–15.8)

Paratypic Series.—We have indicated as paratypes two males and four females bearing the same data as the type and allotype except that three days, September 4, 6 and 8, are represented.

[56] These annuli are more decided in *hondurensis* than in any other Central American *Eumastax* except *E. cerciata* and an occasional female of *E. silvicola.* In the first mentioned species they are as definite in the male as in the female.

Distribution.—The present species is known only from the lower slopes of the Sierra Pija at Lancetilla, near Tela, on the north coast of Honduras. It was found in a very small opening at 700 feet elevation, along a steep trail in very dense rain-forest. This very limited "sunlight hole" had a thick stand of low, glabrous ovate-leaved plants, on which *hondurensis* was found. It was scarce and all seen on the three different visits to the immediate locality were taken, two females on the 4th, three males and two females on the 6th, and one female on the 8th. The actions of *hondurensis*, as far as noted, were essentially the same as those of the other Central American species of the genus.

Specimens examined: 8; 3 ♂, 5 ♀.

HONDURAS: Lancetilla, near Tela, Department of Atlantida, elevation 700 feet; September 4, 6 and 8, 1930; (Academy-Emlen-Worth Expedition; J. A. G. Rehn); 3 ♂, 5 ♀ (*type*, *allotype* and *paratypes*); [A. N. S. P.].

Eumastax cerciata Hebard

1923. *Eumastax cerciata* Hebard, Trans. Amer. Entom. Soc., XLIX, p. 178, pl. xi, figs. 4 and 5. [♂, ♀; Porto Bello, Panama (in part).[57]]

This very distinctive species can at once be separated from the other Central American ones by the characteristic form of the male cerci and the shape of the distal margin of the ultimate sternite (subgenital plate) of the female. At least one of the originally included Porto Bello females we find represents that sex of *veraguae*, and is discussed under that species.

Having no material additional to that before the original describer, we can add nothing to the detailed description of the type and allotype presented in 1923. The figures then published emphasize the principal differential features of both sexes of *cerciata*.

The elimination of erroneously referred females and immature individuals restricts the area of distribution originally assumed for

[57] At least one Porto Bello female, listed as a paratype of *cerciata*, we now know represents that sex of *E. veraguae*. The immature female from Gatun, Canal Zone, Panama, originally listed as *cerciata* is not that species, but may represent *veraguae*. It is somewhat shrivelled and definite reference is hazardous. The female individuals from Boca Murindó, Chocó, Colombia and El Tambo, Chocó, Colombia, originally referred to *cerciata*, similarly are not that species, as shown by the form of the ultimate sternite. Exact reference of these specimens awaits a more complete knowledge of the Colombian species.

the species. Porto Bello, Panama remains the sole locality from which *cerciata* is known, although it doubtless will be found to have a more extensive range over the northern and eastern rain-forest area of Panama and probably Darien.

Specimens examined: 5; 4 ♂, 1 ♀.

PANAMA: Porto Bello; February 19 and March 1, 1911, April 15 and 19, 1912; (August Busck); 4 ♂, 1 ♀ (*paratypes*); [Hebard Cln.].

EXPLANATION OF PLATES

Plate I

Fig. 1.—*Gymnotettix lithocolletus* new species. Lateral view of male (type). Cantarranas, Honduras. (× 6½.)

Fig. 2.—*Episactus tristani* new species. Lateral view of female (allotype). Las Cóncavas, Costa Rica. (× 5.)

Plate II

Fig. 3.—*Lethus oresterus* new genus and species. Lateral view of male (type). Peña Blanca, near Rosario, Honduras. (× 4½.)

Fig. 4.—*Eumastax hondurensis* new species. Lateral view of male (type). Lancetilla, Honduras. (× 4½.)

Plate III

Fig. 5.—*Gymnotettix occidentalis* Bruner. Lateral outline of dorsal portion of head of male. Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 6.—*Gymnotettix occidentalis* Bruner. Lateral view of apex of abdomen of male. Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 7.—*Gymnotettix occidentalis* Bruner. Caudal aspect of apex of abdomen of male. Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 8.—*Gymnotettix occidentalis* Bruner. Dorsal view of apex of abdomen of male. Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 9.—*Gymnotettix occidentalis* Bruner. Outline of ovipositor jaws of type (immature female). Rio Sarstoon, British Honduras. From specimen in British Museum of Natural History, through courtesy of Dr. Uvarov. (Greatly enlarged.)

Fig. 10.—*Gymnotettix occidentalis* Bruner. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female. Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 11.—*Gymnotettix lithocolletus* new species. Lateral view of apex of abdomen of male (type). Cantarranas, Honduras. (Greatly enlarged.)

Fig. 12.—*Gymnotettix lithocolletus* new species. Caudal aspect of apex of abdomen of male (type). Cantarranas, Honduras. (Greatly enlarged.)

Fig. 13.—*Gymnotettix lithocolletus* new species. Dorsal view of apex of abdomen of male (type). Cantarranas, Honduras. (Greatly enlarged.)

Fig. 14.—*Gymnotettix lithocolletus* new species. Cephalic outline of head of male (type). Cantarranas, Honduras. (× 5.)

Fig. 15.—*Gymnotettix lithocolletus* new species. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (allotype). Cantarranas, Honduras. (Greatly enlarged.)

Fig. 16.—*Episactus brunneri* Burr. Dorsal outline of head of female (type of *Parepisactus saltator* Saussure). Guatemala. From specimen in Geneva Museum, through courtesy of Dr. J. Carl. (Greatly enlarged.)

Fig. 17.—*Episactus brunneri* Burr. Lateral outline of head of female (type of *Parepisactus saltator* Saussure). Guatemala. From specimen in Geneva Museum, through courtesy of Dr. J. Carl. (Greatly enlarged.)

Fig. 18.—*Episactus tristani* new species. Lateral outline of head and pronotum of male (type). La Carpintera, Costa Rica. (× 5.)

Fig. 19.—*Episactus tristani* new species. Cephalic outline of head of male (type). La Carpintera, Costa Rica. (× 5.)

Fig. 20.—*Episactus tristani* new species. Details of cephalic aspect of fastigium of male (type). La Carpintera, Costa Rica. (Greatly enlarged.)

Fig. 21.—*Episactus tristani* new species. Lateral view of apex of abdomen of male (type). La Carpintera, Costa Rica. (Greatly enlarged.)

Fig. 22.—*Episactus tristani* new species. Caudal aspect of apex of abdomen of male (type). La Carpintera, Costa Rica. (Greatly enlarged.)

Fig. 23.—*Episactus tristani* new species. Dorsal view of apex of abdomen of male (type). La Carpintera, Costa Rica. (Greatly enlarged.)

Plate IV

Fig. 24.—*Episactus tristani* new species. Lateral outline of apex of abdomen of female (allotype). Las Cóncavas, Costa Rica. (Greatly enlarged.)

Fig. 25.—*Episactus eremites* new species. Lateral outline of apex of ultimate sternite and ventral ovipositor valves of female (allotype). San Cristóbal, Chiapas, Mexico. (Greatly enlarged.)

Fig. 26.—*Episactus tristani* new species. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (allotype). Las Cóncavas, Costa Rica. (Greatly enlarged.)

Fig. 27.—*Episactus eremites* new species. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (allotype). San Cristóbal, Chiapas, Mexico. (Greatly enlarged.)

Fig. 28.—*Episactus eremites* new species. Lateral outline of head and pronotum of female (allotype). San Cristóbal, Chiapas, Mexico. (× 5.)

Fig. 29.—*Episactus eremites* new species. Lateral outline of head and pronotum of male (type). San Cristóbal, Chiapas, Mexico. (× 5.)

Fig. 30.—*Episactus eremites* new species. Dorsal outline of head and pronotum of male (type). San Cristóbal, Chiapas, Mexico. (× 5.)

Fig. 31.—*Episactus eremites* new species. Lateral view of apex of abdomen of male (type). San Cristóbal, Chiapas, Mexico. (Greatly enlarged.)

Fig. 32.—*Episactus eremites* new species. Caudal aspect of apex of abdomen of male (type). San Cristóbal, Chiapas, Mexico. (Greatly enlarged.)

Fig. 33.—*Episactus eremites* new species. Dorsal view of apex of abdomen of male (type). San Cristóbal, Chiapas, Mexico. (Greatly enlarged.)

Fig. 34.—*Lethus maya* new species. Lateral outline of head and pronotum of male (type). Tuxtla Gutierrez, Chiapas, Mexico. (× 5.)

Fig. 35.—*Lethus maya* new species. Dorsal outline of head and pronotum of male (type). Tuxtla Gutierrez, Chiapas, Mexico. (× 5.)

Fig. 36.—*Lethus maya* new species. Lateral view of apex of abdomen of male (type). Tuxtla Gutierrez, Chiapas, Mexico. (Greatly enlarged.)

Fig. 37.—*Lethus maya* new species. Caudal aspect of apex of abdomen of male (type). Tuxtla Gutierrez, Chiapas, Mexico. (Greatly enlarged.)

Fig. 38.—*Lethus maya* new species. Dorsal view of apex of abdomen of male (type). Tuxtla Gutierrez, Chiapas, Mexico. (Greatly enlarged.)

Fig. 39.—*Lethus maya* new species. Lateral outline of head and pronotum of female (allotype). Tuxtla Gutierrez, Chiapas, Mexico. (× 5.)

Fig. 40.—*Lethus maya* new species. Lateral view of apex of abdomen of female (allotype). Tuxtla Gutierrez, Chiapas, Mexico. (Greatly enlarged.)

Fig. 41.—*Lethus maya* new species. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (allotype). Tuxtla Gutierrez, Chiapas, Mexico. (Greatly enlarged.)

Plate V

Fig. 42.—*Lethus oresterus* new species. Cephalic view of head of male (type). Peña Blanca, near Rosario, Honduras. (× 5.)

Fig. 43.—*Lethus oresterus* new species. Dorsal view of head and pronotum of male (type). Peña Blanca, near Rosario, Honduras. (× 5.)

Fig. 44.—*Lethus oresterus* new species. Lateral view of apex of abdomen of male (type). Peña Blanca, near Rosario, Honduras. (Greatly enlarged.)

Fig. 45.—*Lethus oresterus* new species. Caudal aspect of apex of abdomen of male (type). Peña Blanca, near Rosario, Honduras. (Greatly enlarged.)

Fig. 46.—*Lethus oresterus* new species. Dorsal view of apex of abdomen of male (type). Peña Blanca, near Rosario, Honduras. (Greatly enlarged.)

Fig. 47.—*Lethus oresterus* new species. Dorsal outline of head and pronotum of female (allotype). Peña Blanca, near Rosario, Honduras. (× 5.)

Fig. 48.—*Lethus oresterus* new species. Lateral view of apex of abdomen of female (allotype). Peña Blanca, near Rosario, Honduras. (Greatly enlarged.)

Fig. 49.—*Lethus oresterus* new species. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (allotype). Peña Blanca, Honduras. (Greatly enlarged.)

Fig. 50.—*Lethus maya amrami* new subspecies. Lateral view of head and pronotum of female (type). Piedras Negras, Guatemala. (× 5.)

Fig. 51.—*Lethus maya amrami* new subspecies. Dorsal view of head and pronotum of female (type). Piedras Negras, Guatemala. (× 5.)

Fig. 52.—*Lethus maya amrami* new subspecies. Cephalic aspect of head of female (type). Piedras Negras, Guatemala. (× 5.)

Fig. 53.—*Lethus maya amrami* new subspecies. Lateral view of apex of abdomen of female (type). Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 54.—*Lethus maya amrami* new subspecies. Ventral view of apex of ultimate sternite and ventral ovipositor valves of female (type). Piedras Negras, Guatemala. (Greatly enlarged.)

Fig. 55.—*Eumastax kressi* new species. Lateral view of apex of abdomen of male (type). Suretka Trail, Estrella Valley, Costa Rica. (Greatly enlarged.)

Fig. 56.—*Eumastax kressi* new species. Caudal aspect of ultimate sternite of male (type). Suretka Trail, Estrella Valley, Costa Rica. (Greatly enlarged.)

Fig. 57.—*Eumastax kressi* new species. Dorsal view of apex of abdomen of male (type). Suretka Trail, Estrella Valley, Costa Rica. (Greatly enlarged.)

Plate VI

Fig. 58.—*Eumastax kressi* new species. Ventral view of apex of ultimate sternite of female (allotype). Suretka Trail, Estrella Valley, Costa Rica. (Greatly enlarged.)

Fig. 59.—*Eumastax surda* Burr. Lateral view of apex of abdomen of male. Pozo Azul de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 60.—*Eumastax surda* Burr. Caudal aspect of ultimate sternite of male. Pozo Azul de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 61.—*Eumastax surda* Burr. Dorsal view of apex of abdomen of male. Pozo Azul de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 62.—*Eumastax surda* Burr. Ventral view of apex of ultimate sternite of female. Pozo Azul de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 63.—*Eumastax dentatus* Saussure. Lateral view of apex of abdomen of male. Between Rio Colorado and Sabanillas de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 64.—*Eumastax dentatus* Saussure. Caudal aspect of ultimate sternite of male. Between Rio Colorado and Sabanillas de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 65.—*Eumastax dentatus* Saussure. Dorsal view of apex of abdomen of male. Between Rio Colorado and Sabanillas de Pirrís, Costa Rica. (Greatly enlarged.)

Fig. 66.—*Eumastax sylvicola* new species. Lateral view of apex of abdomen of male (type). La Emilia, near Guápiles, Costa Rica. (Greatly enlarged.)

Fig. 67.—*Eumastax sylvicola* new species. Caudal aspect of ultimate sternite of male (type). La Emilia, near Guápiles, Costa Rica. (Greatly enlarged.)

Fig. 68.—*Eumastax sylvicola* new species. Dorsal view of apex of abdomen of male (type). La Emilia, near Guápiles, Costa Rica. (Greatly enlarged.)

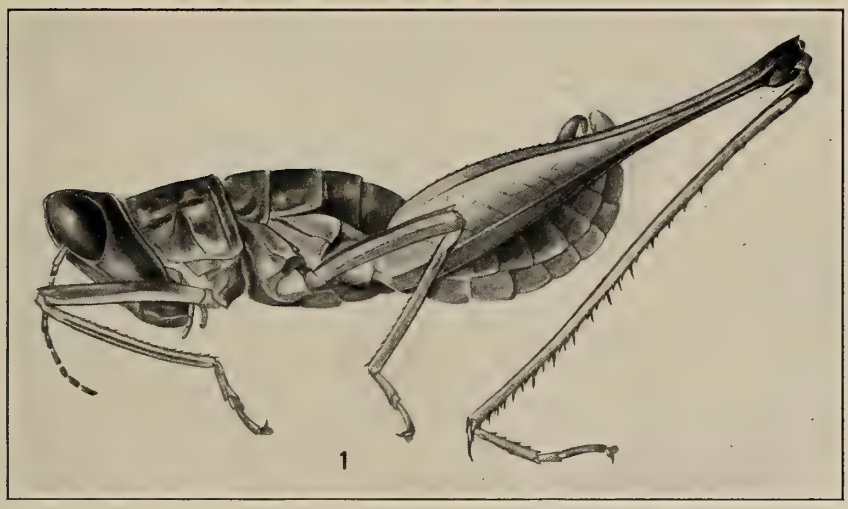
Fig. 69.—*Eumastax sylvicola* new species. Ventral aspect of apex of ultimate sternite of female (paratype). La Emilia, near Guápiles, Costa Rica. (Greatly enlarged.)

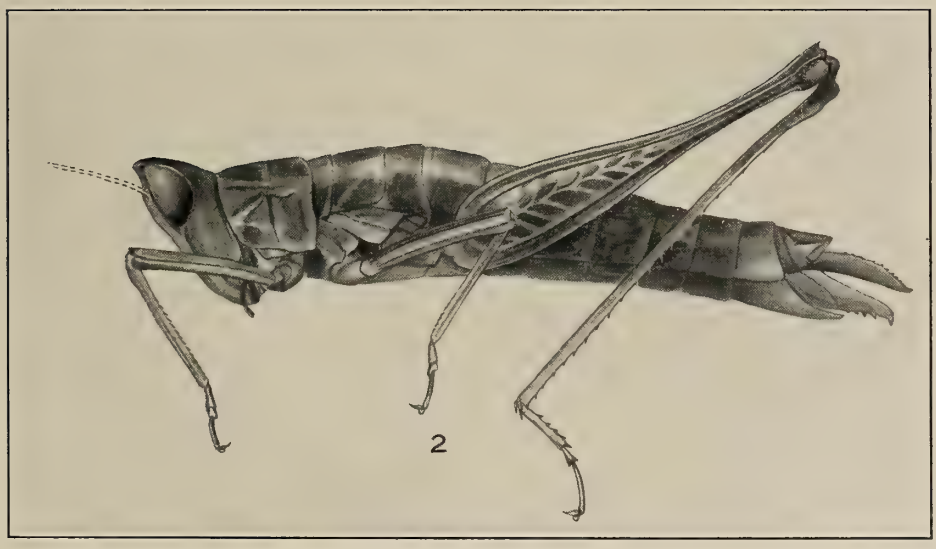
Fig. 70.—*Eumastax hondurensis* new species. Lateral view of apex of abdomen of male (type). Lancetilla, Honduras. (Greatly enlarged.)

Fig. 71.—*Eumastax hondurensis* new species. Caudal aspect of ultimate sternite of male (type). Lancetilla, Honduras. (Greatly enlarged.)

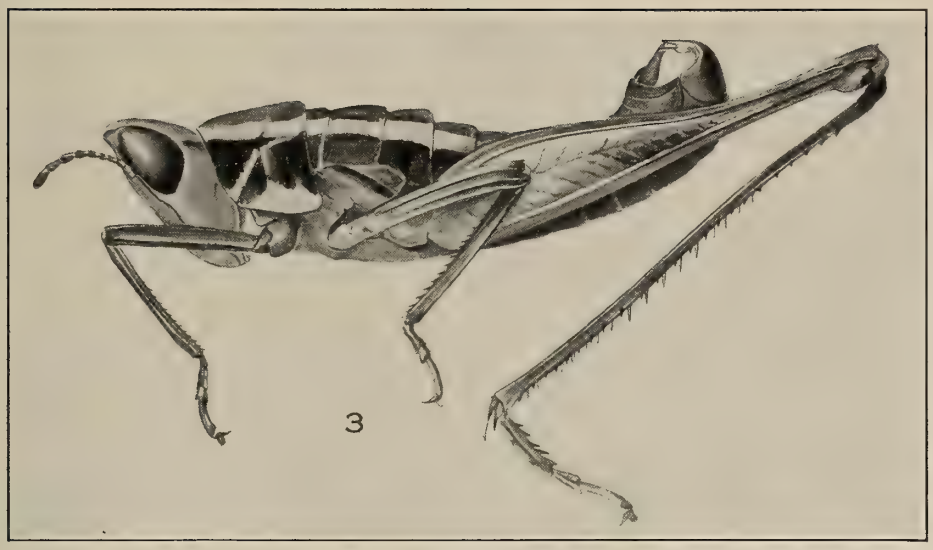
Fig. 72.—*Eumastax hondurensis* new species. Dorsal view of apex of abdomen of male (type). Lancetilla, Honduras. (Greatly enlarged.)

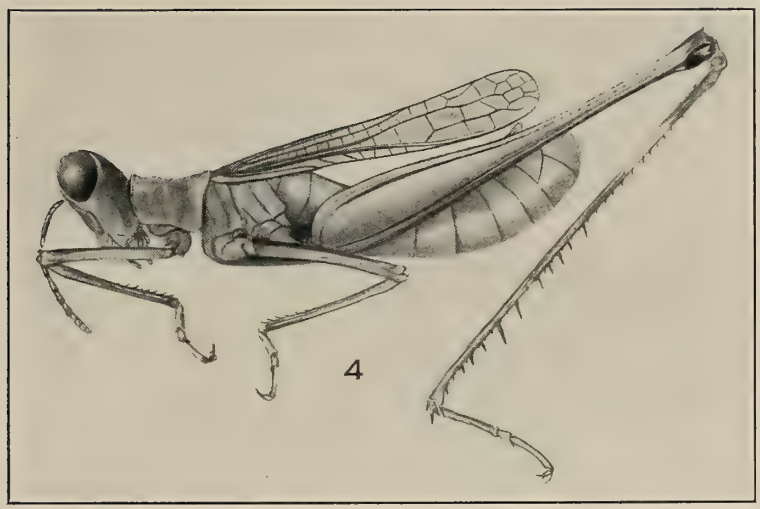
Fig. 73.—*Eumastax hondurensis* new species. Ventral aspect of apex of ultimate sternite of female (allotype). Lancetilla, Honduras. (Greatly enlarged.)



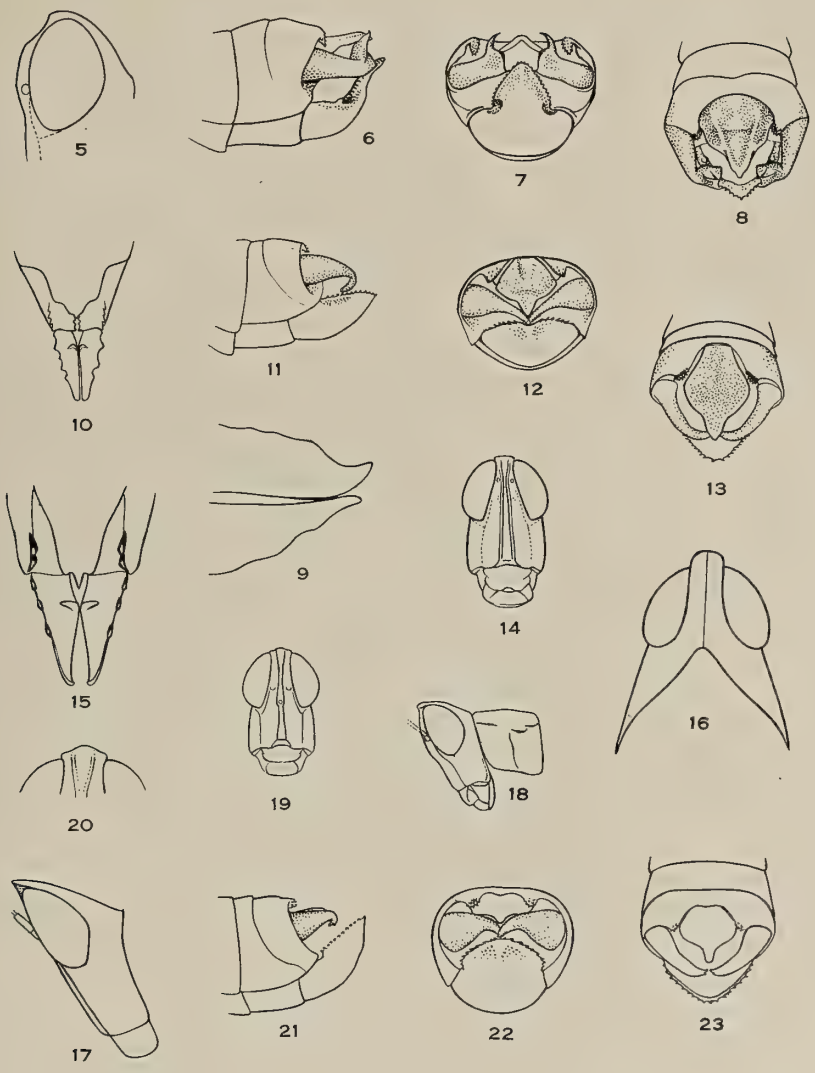


REHN AND REHN—EUMASTACINAE





REHN AND REHN—EUMASTACINAE



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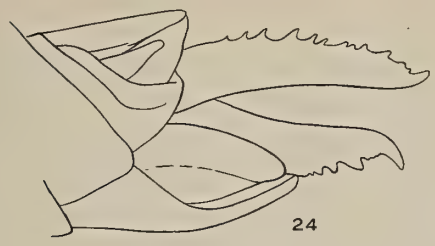
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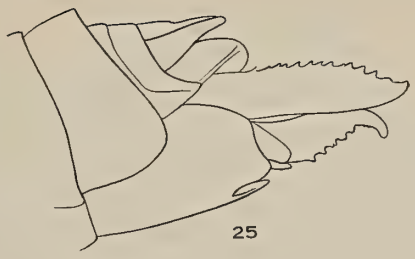
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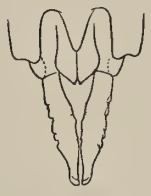
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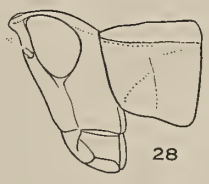
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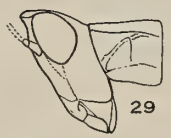
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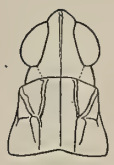
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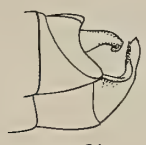
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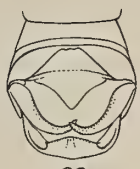
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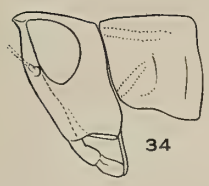
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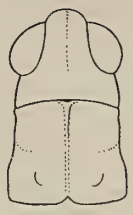
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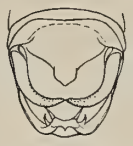
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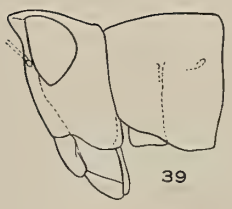
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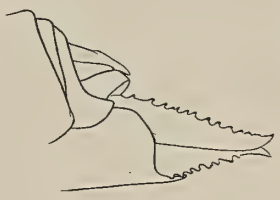
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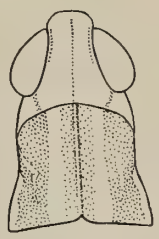

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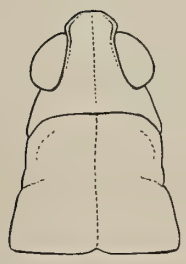

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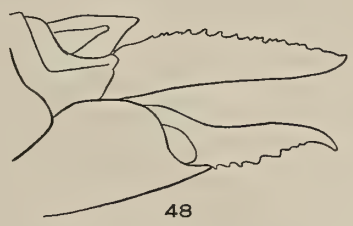

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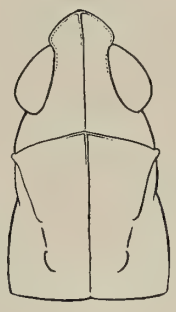

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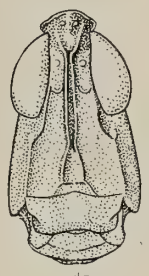

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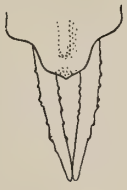

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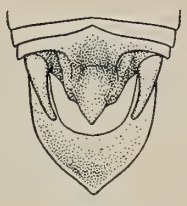

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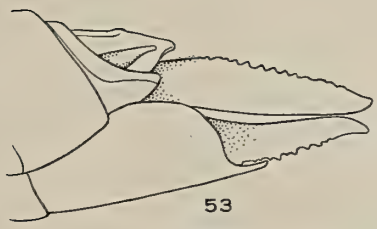

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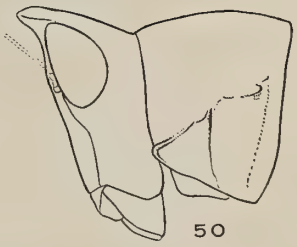

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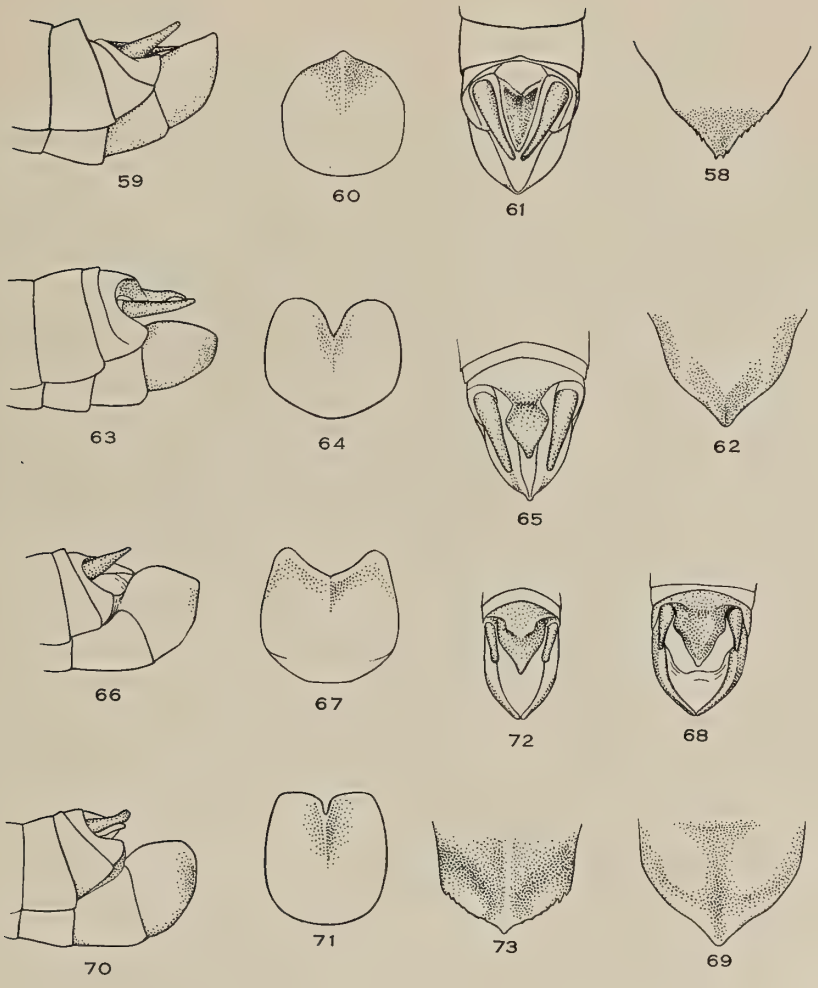

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